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THE ACADEMIC AND SOCIAL ACHIEVEMENT, AND INTELLECTUAL STATUS OF A GROUP OF RESIDENTIAL SCHOOL CHILDREN BLINDED BY RETROLENTAL FIBROPLASIA

A Dissertation

Presented to

the Faculty of the School of Education

Boston University

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

The result of impairment in the human organism has always been a source of concern to inquisitive and sensitive individuals. In much of the thought issuing from such interest, objective observation has been used as a basis for developing those insights which have contributed to our understanding of the human species and to the progress of its knowledge. However, there has also been considerable thinking based fundamentally on inferences, educated guesses, and even romantic fancies. Only occasionally has such thinking been supported by subsequent research. Unfortunately, the course of science is devious and slow in correcting misconceptions, and, before clarification occurs, much ill-judgment and sorrow can result.

During the present generation, retrolental fibroplasia, the most recent major blinding disease of children, was described, was injurious to many, and finally was modified. The disease affected premature infants almost exclusively and, while the primary sensory damage was to the eyes, it was also thought that brain damage might be a secondary result. Medical science was able to chart explicitly the course of this disease after its initial description, but it was not until more than sixty possible causes were painstakingly investigated that a prophylactic was found. In 1949 the etiology of retrolental

fibroplasia was determined though it was not generally confirmed until after 1952.

Through the years, social scientists have had to deal with this new addition to the population of visually handicapped children. Psychologists and social workers have seen problems of parental rejection particularly associated with this diagnostic group. They have been able to develop technics of counseling and environmental manipulations which have affected significantly the mental health of the retrolental fibroplasic child and of his parents.

As these children have entered pre-school and school programs, educators have been concerned not only with the level of their academic achievement but with their cumulative effect on the total school-age blind population. Unfortunately, subjective judgments and limited observations have colored conclusions in these regards. As a result, the educational information pertaining to the retrolental fibroplasic child is, to date, incomplete and often unsubstantiated and suspect.

I. THE PROBLEM

Statement of the problem. The purposes of this study were as follows: (1) to examine and analyze the academic achievement of a group of residential school children blind as a result of retrolental fibroplasia; (2) to determine the educational comparability of this group with a residential school population blind for other reasons; (3) to investigate

the distribution of intelligence within the retrolental fibroplasic population; (4) to determine their intellectual comparability with a residential school population blind for other reasons; (5) to inquire into the social adjustment of the retrolental fibroplasic as compared to that of other residential school children blind for different reasons; (6) to develop prognosis with regard to the future educational development of the retrolental fibroplasic population and especially with reference to those larger numbers who will soon be entering the secondary school programs.

Importance of the study. The incidence of retrolental fibroplasia, which showed a persistent growth through the 1940's, was decreased, owing to the efforts of medical science, in the first half of the following decade. Further, various of the social sciences were able to modify emotional and social problems associated with the retrolental fibroplasic child. However, little consideration was given to the study of the educational character of the group. As a result, there was a paucity of data on that important qualitative aspect of the retrolental fibroplasic population. This study was made in an effort to correct that deficiency.

In the division of the population of blind children into diagnostic categories, for the period 1940-1950, the retrolental fibroplasic group constituted the largest numerical unit within those divisions.[1] Their large number had its effect upon the

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[1]C. Edith Kerby, "Causes of Blindness in Children of School Age," Sight Saving Review, 28:14, Spring, 1958.

character of the total blind school group, and the effect was in need of description and understanding.

The retrolental fibroplasic population had been attending schools in numbers for eight years. Numerically, and in terms of grade spread, the statistical treatment of the academic character of the group appeared feasible. Any curricula changes which could, as a result, be suggested might be instituted with beneficial results to those in the advanced grades and optimum results for those at lower grade levels.

The lack of controlled educational research and objective evaluations based on statistical treatment of numbers of retrolental fibroplasically blinded children resulted in the growth of certain stigmatizing beliefs. The basis for such beliefs needed to be analyzed thoroughly and exposed.

Those social and rehabilitation agencies which had specific concern with the employment, training, and other placement of the blind were faced with the prospect of increased dealings with the retrolental fibroplasic group. The intellectual and educational ability of the group needed to be considered in developing employment objectives as well as in planning staff and financial commitments, employer counseling, and public relations. It was the intent of the study to develop information which would assist the agencies in their services to the retrolental fibroplasic group and to the community at large.

The essential importance of the study was felt by the writer to be that of providing objective data on the group so

that educational, social, and vocational needs might be met more effectively.

II. DEFINITION OF TERMS

Retrolental fibroplasia. The disease retrolental fibroplasia was determined to be a distinct clinical entity.[2] A disease of the retina and vitreous retrolental fibroplasia was shown to have an acute phase as well as a cicatricial phase with the severity of damage depending on the intensity of the first phase.[3] Prematurity of birth appeared to be a necessary condition for disposition towards the disease as well as exposure of the infant to an environment with a high oxygen content.[4]

Retrolental fibroplasia was defined medically as "persistence of the embryonic vascular tissue of the lens and/or growth of embryonic tissue behind the lens."[5] While some investigators felt that the term retrolental fibroplasia merely described one stage of a disease, the term appeared in

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[2]Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1426, October, 1952.

[3]Ibid., pp. 1430.

[4]L. J. Filer, Jr. (comp.), Retrolental Fibroplasia: Role of Oxygen, Report of the Sixteenth M and R Pediatric Research Conference (Columbus, Ohio: M and R Laboratories, 1955), pp. 11-17.

[5]Leslie Brainerd Arey and others, Dorland's Illustrated Medical Dictionary (twenty-third edition; Philadelphia: W. B. Saunders Company, 1957), p. 508.

the literature to be generally accepted as designating that disease of the eyes resulting from various factors including prematurity and high oxygen environment.[6]

Blind. Throughout the study, the term blind referred to level of visual acuity. For the purpose of this study, the definition of blindness used by the American Foundation for the Blind and the National Society for the Prevention of Blindness was adopted.

> Central visual acuity of 20/100 or less in the better eye, with correcting glasses; or central visual acuity of more than 20/200 if there is a defect in which the peripheral field has contracted to such an extent that the widest diameter of a visual field subtends an angular distance no greater than 20 degrees.[7]

Visual acuity. In this study, visual acuity referred to the functional level of vision. It was observed that whereas all the children within the study population met the common definition of blindness, this did not mean that they were devoid of visual sensations. On the contrary, numbers of the children and youths were able to perceive light sources;

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[6]Parker Heath, "Retrolental Fibroplasia as a Syndrome: Pathogenesis and Classification," Archives of Ophthalmology, 44:272, August, 1950; Patrick D. Trevor-Roper, Ophthalmology: A Textbook for Diploma Students (Chicago: The Lear Book Publishers, Inc., 1955), p. 587.

[7]Manual of the Use of the Standard Classifications of Blindness, p. 3, cited by Georgie Lee Abel, "The Education of Blind Children," Education of Exceptional Children and Youth, William M. Cruickshank and G. Orville Johnson, editors (Englewood Cliffs, New Jersey: Prentice-Hall, 1958), p. 296.

others could differentiate between light and its absence, and still others had, in addition, object perception by vision.

Those subjects who obtained a visual sensation were differentiated from those who did not, and both groups were treated individually in terms of the study's aim. Those who obtained visual sensations were referred to as the Visual Response Group.

Age. Chronological age was tabulated in this study. In each instance such age was calculated to the subject's nearest birthday at the time data were collected.

Diagnostic group. For the purpose of this study, diagnostic group refers to the pathology involved in visual deprivation. It was not possible to use etiology as the basis for differentiating the various groups owing to the obscurity of such information in so many cases. The diagnostic groups were: (1) retrolental fibroplasia, (2) cataracts, (3) retinitis pigmentosa, (4) buphthalmus/glaucoma, (5) optic atrophy, (6) retinoblastoma, and (7) amblyopia. In addition, an eighth category designated as "other" was used for those cases in which diagnostic information was lacking, as well as for additional diagnostic groups in which there were not sufficient cases to have statistical meaning. The buphthalmus/glaucoma category contained subjects with a buphthalmus diagnosis; others with glaucoma and additional ones with the combined diagnoses. As intraocular pressure was involved in each

diagnosis the three categories were subsumed under the dual heading.

Residential school. Throughout this study, residential school referred to an educational center which also provided domiciliary services to children who were classified as blind. Further, residential school denoted the primary function of education as opposed to a custodial function.

The main body of the study was developed from data collected at the Perkins School for the Blind, Watertown, Massachusetts.

Academic achievement. For the purpose of this study academic achievement referred to demonstrated scholastic achievement. The academic program was the curriculum, while achievement referred to the individual's level of proficiency in meeting the demands of the curriculum.

Two measures of academic achievement were used. One was teacher evaluation of achievement, or grade scores; the other, academic achievement test scores. Both measures were tabulated for academic subjects and intercomparisons were made. Technological and physical proficiency grades, such as gym and manual arts, were excluded in that the achievement tests were not constructed to obtain objective measures of those skills.

Grade. The references to grade in this study were denotative of the division in the educational curriculum so developed as to correspond to the changing academic abilities

and needs of the students. The grade represented a certain period of time being fixed at the length of the school year and it was felt that the normal student would make an orderly progress from grade to grade, year by year. Grade also connoted a general homogeneity of individuals within its placement insofar as academic ability, emotional and social development, and chronological age were concerned.

Certain exceptions to the above definition existed. For example, the Special Class and Ungraded Section contained students who were not necessarily comparable in terms of chronological age and emotional and social development. However, for reasons of utility, all students were assumed to have met the grade placement definition.

Special Class. Special Class referred to a distinctive and unique placement in the grade scheme. Special referred to the ability of individuals to function academically and connoted inability to achieve at a level appropriate to chronological age. For that reason, the education program for children in the Special Class differed from that of the children in the regular grades. The intellectual handicap of the children in the Special Class was considered in curricula planning, and, as a result, the program was not fully academic for the enrollees.

The Perkins School had a Special Class and an Ungraded Section of a regular grade with the former being placed in the elementary school as a Primary Special Class while the latter

was at the junior high school level. The Ungraded Section was, in effect, an Intermediate Special Class though its name appeared to have been developed as an administrative convenience.

Section. Section refers to the division within any given grade. Each grade was divided into an A and B Section with several grades having an additional C Section. The section was a qualitative refinement of grade placement, with the children of a particular grade being assigned to a specific section depending on demonstrated ability in the academic program as well as measured academic ability. Those children who met the academic requirements for their grade to a very high order were placed in the A Section. Those who were less adequate were placed in the B Section, while the C Section, when there was one, was for those whose ability and performance, while meeting the grade requirement, was least acceptable. In effect and in practice, the Section was a further refinement of the grade.

Multiple handicap. The term multiple handicap referred, in this study, to a disability concomitant with blindness. The following multiple handicaps were found in the population of the study: (1) cerebral palsy, (2) speech handicap, (3) epilepsy, (4) diabetes, (5) auditory impairment, (6) arthritis, and (7) the combination cerebral palsy and speech handicap.

No one of the seven categories of multiple handicap

contained a large enough number of subjects so that statistical findings would warrant generalizations about the character of its population. However, when all of the multiply handicapped subjects were considered as a group, statistical analysis was thought to be reasonable. The rationale was that the special treatment which they received in terms of therapy or medication or other physical attention served to give those individuals a unique status. The uniqueness constituted sufficient grounds, it was felt, for grouping multiply handicapped subjects and investigating them in terms of the aims of the study.

Social achievement. In this study social achievement referred to the ability of individuals and groups to conform to the standards for social interaction established by the school. In addition, social achievement had the connotations of ability to meet responsibility within the school community and to relate effectively to adults and peers.

Referrals to the Guidance Committee of the school served as the basis for evaluating social achievement as well as did comportment as measured by conduct in the classroom setting.

Guidance referral. In this study, guidance referral concerned the relationship of subjects to the Guidance Committee of the Perkins School. Students whose activities represented a departure from acceptable emotional and social behavior as well as poor academic performance were referred to

the Guidance Committee for its action. While it was realized that much guidance was provided the students in their contact with teachers, house mothers, and other staff members, it was only when the Guidance Committee was formally involved in dealing with an individual child that a referral was tabulated.

Members of the Guidance Committee consisted of the director of the school, speech therapist, head social worker, guidance counselor, and, when requested, department heads or other professionally trained individuals. This committee functioned as an evaluative and recommending body with regard to the students referred to it. The decisions of the committee were implemented by the guidance counselor, school personnel, department heads, and house mothers.

The objective in treating this data was that of gaining insight into the social achievement of the various diagnostic groups.

Number of referrals. Number of referrals in this study concerned guidance referrals and the number of times any given student had been referred to the Guidance Committee. Each time a student appeared on the Guidance Committee agenda, it was calculated as a referral. However, owing to the fact of time limitation and scheduling problems, the same referral was occasionally discussed at several consecutive Guidance Committee meetings. It was, therefore, necessary to impose the condition that an agenda without a given individual's name intervene between two agenda on which that same individual's

name appeared in order that two separate referrals be enumerated.

Type referral. Type referral indicated the manifest nature of the guidance referral. It was felt necessary to make that specific limitation in order that data might be substantiated. It appeared to the writer that the latent reason or reasons for any given type of referral could not always be determined.

There were four separate categories under the heading of type referral as well as five combinations of the four categories. The separate categories which emerged from the data were: (1) family, (2) physical behavior, including peer relationships, (3) scholastic, (4) physical. Combinations of the four categories were necessary as one referral often included aspects of another category. An example of a combination was as follows: behavior problems associated with scholastic failure -- not an uncommon association.

Referral disposition. The references to referral disposition in this study denoted what the Guidance Committee had done with the cases referred to it. The data indicated that the Guidance Committee disposed of referrals in six different ways and in three combinations of the six ways. The referral dispositions were as follows:
(1) guidance and counseling; (2) environmental manipulation;
(3) psychiatric treatment; (4) medical treatment; (5) discipline;

(6) no program necessary; (7) combination guidance and counseling with environmental manipulation; (8) combination environmental manipulation and psychological treatment; (9) combination psychological and medical treatment.

This information was analyzed in order to determine if any particular patterns of referral disposition were associated with the various diagnostic groups of visual pathology.

Intelligence and intelligence tests. Intelligence in this study referred specifically to the score obtained on a given test of intelligence. The following intelligence tests were used: (1) Interim-Hayes Binet Intelligence Test for the Blind, 1942 revision; (2) Wechsler-Adult Intelligence Scale; (3) Wechsler Intelligence Scale for Children.

The intelligence tests were specially adapted for the blind and partially sighted from standardized intelligence tests for sighted persons. All of the subjects in the population of this study were given an intelligence test. A detailed description of the adaptation of the various intelligence tests is contained in Chapter III of this study.

Achievement test. Within the study, achievement test scores referred to the Stanford Achievement Test, Forms E, F, J, and K, Intermediate and Advanced batteries. Sub-test scores were obtained in reading, word meaning, language usage, arithmetic reasoning, social studies, science, and spelling.

The Stanford Achievement Test was constructed for and

standardized on a sighted population. A detailed description of the adaptations necessary for its use with a blind and partially sighted population is contained in Chapter III of this study.

III. ORGANIZATION OF REMAINDER OF DISSERTATION

The remainder of this dissertation will be divided into Chapters and titled as follows: Chapter II, Review of the Literature; Chapter III, The Materials Used and Groups Studied; Chapter IV, Statistical Analysis and Sub-group Exposition; Chapter V, Summary and Conclusions. A Bibliography and an Appendix follow.

CHAPTER II

REVIEW OF THE LITERATURE

The literature pertaining to retrolental fibroplasia was found to be voluminous in some respects and extremely limited in others. In considering those areas in which research was both extensive and intensive, the writer felt that science in its humanitarian role had served the human community in an exemplary fashion. Conversely, those other areas of human functioning where research and investigation were clearly in order, but where the response by segments of the scientific fellowship was that of limited effort, showed less reason for pride.

I. LITERATURE ON THE NATURE AND COURSE OF RETROLENTAL FIBROPLASIA

Although the first physiological description of retrolental fibroplasia was made in the literature by Terry, the initial diagnosis of the disease occurred at the University of Chicago Clinic in 1937.[1] Terry's article was based on his observation of five cases, all of whom weighed three pounds or less at birth.[2] Through correspondence and review of the

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[1] Miriam Norris, Patricia J. Spaulding, and Fern H. Brodie, Blindness in Children (Chicago: University of Chicago Press, 1957), p. 3.

[2] T. L. Terry, "Extreme Prematurity and Fibroplastic Overgrowth of Persistent Vascular Sheath Behind Each Crystalline Lens," American Journal of Ophthalmology, 25:203, February, 1942.

literature, he determined that the condition he called retrolental fibroplasia had not been generally encountered, and he noted:

> Should this group of cases be not a most unusual coincidence but a complication of extreme immaturity, then it is important not only to establish the frequency but also to work out promptly the most satisfactory therapy.[3]

The topological aspects of Terry's article in 1942 proved less important than the prophetic nature of his intervening comments. In effect, Terry had postulated a new pathology in prematurity, the frequency of which was never established unequivocally and for which a satisfactory therapy was never developed.

The clinical descriptions of retrolental fibroplasia appeared to be widely uniform in regarding the condition as a unique entity insofar as it affected the vitreous and retina.[4] The primary condition was identified by a fibrous tissue.[5] The tissue or membrane was composed of "detached retina angioblastic tissue, and/or organized viterous material."[6] There was found to be rather general consensus on the development of the

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[3]Ibid., p. 204.

[4]Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1426-1427, October, 1952.

[5]V. Everett Kinsey and Leona Zacharias, "Retrolental Fibroplasia," Journal of the American Medical Association, 139:572, February, 1949.

[6]Zacharias, op. cit., p. 1427.

disease within the broad phases of acute and cicatrical stages.[7] The severity of visual involvement appeared to be related to the gravity of the former or acute stage.[8]

As Zacharias noted in her survey of literature, the emphasis put on various aspects of evaluation in the acute phase differed, though there was accord on the point of disease course or effect in that phase.[9] The writer felt it sufficient for the purposes of this study to indicate that the acute phase of the disease could be recognized as a result of retinal detachment, retinaledema, enlargement of retinal vessels, and hemorrhaging in the retina and viterous.[10]

The cicatrical or scarring phase of the disease was seen to be an out-growth of the acute stage and was the point at which the membrane within the eye became organized.[11]

Through the years, various refinements were made on the dycotomy of acute and cicatrical stages, and additional phases

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[7]Algernon B. Reese, "Retrolental Fibroplasia," Archives of Ophthalmology, 44:754-755, November, 1950; William O. La Motte, Jr., and George S. Tyner, "Observations of Retrolental Fibroplasia," Archives of Ophthalmology, 44:620-621, October, 1950; Zacharias, op. cit., pp. 1426-1427.

[8]William Councilman Owens, "Symposium: Retrolental Fibroplasia (Retinopathy of Prematurity): Clinical Course," American Journal of Ophthalmology, 40:159-161, August, 1955.

[9]Zacharias, loc. cit.

[10]Ibid.

[11]L. Emmett Holt, Jr. (Chairman), A Conference on Retrolental Fibroplasia, Report of the Second Ross Pediatric Conference (Columbus, Ohio: M and R Laboratories, 1951), p. 16; Reese, op. cit., p. 755.

were defined. At least one investigator developed sub-stages or grades in the several stages, and, in addition, attributed extent of ocular involvement and optical distortion to the grade level which any given affected child may have reached.[12] In that regard, Szewczyk mentioned that the literature presented cases in which spontaneous regression of retrolental fibroplasia occurred without severe damage to the eyes.[13] However, in those cases in which there was no regression, the damage to the eyes varied from slight to total blindness as a result of the membranous growth.[14]

The pathological descriptions of retrolental fibroplasia, including reports of microscopic sections of enucluated eyes, indicated a variety of opinions regarding the nature of the disease.[15] However, there seemed to be general agreement as to the vulnerability of the retina to a toxic agent.[16] It was

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[12]Owens, op. cit., pp. 159-162.

[13]Thaddeus S. Szewczyk, "Retrolental Fibroplasia: Etiology and Prophylaxis," American Journal of Ophthalmology, 34:1649, December, 1951.

[14]V. Everett Kinsey and F. M. Hemphill, "Etiology of Retrolental Fibroplasia," American Journal of Ophthalmology, 40:168-173, August, 1955; Arlington C. Krause, "Congenital Encephalo-Ophthalmic Dysplasia," Archives of Ophthalmology, 36:387-444, October, 1946.

[15]Parker Heath, "Pathology of the Retinopathy of Prematurity: Retrolental Fibroplasia," American Journal of Ophthalmology, 34:1249-1259, September, 1951; T. E. Saunders, "Pseudoglioma: A Clinicopathologic Study," American Journal of Ophthalmology, 35:207-211, February, 1952.

[16]Ibid.

noted, also, that bilaterality of visual involvement was the usual result of the disease.[17]

That retrolental fibroplasia was most usually associated with prematurity was noted elsewhere in this study. Concomitant with prematurity was the importance of birth weight. It was seen that a birth weight of four pounds or less was associated with the development of the disease.[18] It followed, therefore, that the shorter the gestation period, the greater the likelihood of the premature child contracting the disease.[19]

Research indicated that the disease did not appear to be hereditary.[20] However, there did seem to be some correlation between skin pigmentation and susceptibility to the disease in the sense that it was shown to be more common among the white than the Negro population.[21], Platou found not a single case in a population of a hundred and thirty-one premature infants,

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[17]Massachusetts Eye and Ear Infirmary, Retrolental Fibroplasia: For Parents of Children Who Have This Occular Condition (Boston: Massachusetts Eye and Ear Infirmary, 1948), p. 3; Merrill J. King, "Retrolental Fibroplasia," Archives of Ophthalmology, 43:697, April, 1950.

[18]Kinsey and Zacharias, op. cit., p. 578; King, op. cit., p. 698-701; Edward R. Schlesinger, and Isabel McCaffrey, "Incidence of Gross Visual Defect Due to Retrolental Fibroplasia," Pediatrics, 11:239-242, March, 1953.

[19]Zacharias, op. cit., pp. 1430-1431.

[20]Theodore H. Ingalls, "Congenital Encephalo-Ophthalmic Dysplasia," Pediatrics, 1:323, March, 1948; Krause, op. cit., pp. 438-443.

[21]Holt, op. cit., p. 33.

seventy per cent of whom were Negro.[22] Speert, Blodi and Reese reported only two Negro cases of retrolental fibroplasia among two series of one hundred and ninety cases in New York.[23] There was nothing in the literature at the disposal of the writer which suggested that pediatric management of white and Negro premature infants differed materially.[24]

II. LITERATURE ON THE INCIDENCE OF RETROLENTAL FIBROPLASIA

The question of the true incidence of the disease was found to be unanswerable by the writer. As was noted, the possibility of regression in the disease was demonstrated in the literature.[25] It seemed likely, therefore, that the disease could have been present in the active stage and then regressed, leaving no stigmata and never having been diagnosed. Basis for such an opinion was found in the exposition of the disease by Owens and Owens, especially where they referred to the incidence of the acute phase being so much greater than anticipated, owing to earlier study having been limited to

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[22] Ibid.

[23] Harold Speert, Frederick C. Blodi and Algernon B. Reese, "Retrolental Fibroplasia: A Hazard of Premature Birth," American Journal of Obstetrics and Gynecology, 59:248, February, 1950.

[24] Ibid.; Holt, op. cit., pp. 32-34.

[25] Thaddeus S. Szewczyk, Retrolental Fibroplasia: Etiology and Prophylaxis," American Journal of Ophthalmology, 34:1649-1650, December, 1951.

infants with more severe residual damage.[26]

Further difficulty in calculating incidence was suggested by Zacharias. She pointed out that the descriptions of the disease and of its development were so recent that many doctors may not have recognized it.[27] Zacharias further noted that incidence was obscured owing to the fact that diagnostic criteria had not been clearly defined and that some reports included only those cases where severe secondary damage was present while others were concerned only with cases in the acute stage.[28]

In addition, further complications such as continuing alterations in the number of cases, the severity of the disease, and the geographical location of reported cases compounded an already beclouded picture.[29] Incidence was observed to wax and wane in an inexplicable fashion not only between geographical locations, but within hospital systems situated in the same general area.[30] In that later respect, Platou reported on his observations made at a number of hospitals in a single city where one institution had not a solitary case among 2,000

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[26]William Councilman Owens and Ella Uhler Owens, "Retrolental Fibroplasia in Premature Infants," American Journal of Ophthalmology, 32:5-7, January, 1949.

[27]Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1433, October, 1952.

[28]Ibid.

[29]Ibid., pp. 1433-1434.

[30]Hugh Ryan, "Retrolental Fibroplasia," American Journal of Ophthalmology, 35:327-330, March, 1952; Zacharias, op. cit., p. 1434.

premature births, whereas other hospitals of the same city were discovering cases of the disease.[31] A number of investigators introduced evidence of the capricious nature of the disease. Reports from the University of Chicago Hospital indicated a thirty per cent level of incidence over a three-year period following a nine-year period of approximately seven per cent incidence.[32]

Statistics from New York Hospitals exhibited extensive fluctuation.[33] This same general variation was observed in the reports of incidence from the Boston-Lying-In Hospital where fluctuation from year to year was as great as eighteen per cent in the incidence of retrolental fibroplasia.[34] In respect to the oscillation of the disease incidence, Zacharias noted the possibility of even greater instability when consideration was given to the fact that prior to 1949, only cases with severe damage were likely to have been reported.[35]

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[31] L. Emmett Holt, Jr. (Chairman), A Conference on Retrolental Fibroplasia, Report on the Second Ross Pediatric Research Conference (Columbus, Ohio: M and R Laboratories, 1951), pp. 32-33.

[32] W. R. Hepner, Arlington C. Krause, and Helen E. Nardin, "Retrolental Fibroplasia," Pediatrics, 5:774, May, 1950.

[33] Edward L. Pratt, "Experiences with Corticotrophin (ACTH) in the Acute Stage of Retrolental Fibroplasia," American Journal of Diseases of Children, 82:243, August, 1951.

[34] Zacharias, op. cit., p. 1434.

[35] Ibid., p. 1433.

Some extrapolated estimates of the size of the retrolental fibroplasic population were reported. Reese estimated the pre-school blind population to be one-third retrolental fibroplasic.[36] Lowenfeld indicated almost seventy-five per cent of pre-school blind children were in that diagnostic category.[37] The most authoritative estimates of the size and composition of the blind school age and pre-school age population were felt by the writer to have been made by Kerby. These estimates contained figures on various etiological and diagnostic groups, including retrolental fibroplasia. Using data collected from agencies for the blind in twenty-two states, the District of Columbia, and Hawaii, she estimated that at the end of 1950, there were approximately five thousand five hundred pre-school blind children in the United States, and that the number might well exceed six thousand by 1953.[38] In an intensive analysis of two thousand and eight hundred blind children under seven years of age in 1950, Kerby found almost fifty per cent of the cases were blind as a result of retrolental fibroplasia.[39] Further, Kerby noted, in comparing data for the

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[36]Algernon B. Reese, "Persistence and Hyperplasia of Primary Vitreous: Retrolental Fibroplasia -- Two Entities," Archives of Ophthalmology, 41:528, May, 1949.

[37]Berthold Lowenfeld, "If He Is Blind," Special Education for the Exceptional, Merle E. Frampton and Elena D. Gall, editors (Boston: Porter Sargent Publishers, 1955), p. 49.

[38]C. Edith Kerby, "Blindness in Pre-School Children," Sight Saving Review, 24:28, Spring, 1954.

[39]Ibid.

years between 1943 and 1950, an increase of almost fifty per cent in pre-school blindness chiefly as a result of the disease retrolental fibroplasia.[40] Kerby also noted that approximately nineteen and three-tenths per cent of the children in the blind school population during 1953-54 were retrolental fibroplasic, and that by 1960 they would constitute fifty per cent of children enrolled in educational programs for the blind, owing to the enrollment of many retrolental fibroplasic children who were, as of 1953-54, still of pre-school age.[41]

Others have also reported on the immense growth of the retrolental fibroplasic school population as compared to those school children blind for other reasons. Lowenfeld noted in 1953 that the pre-school program for blind children in Southern California had represented a seventy-four per cent increase over the number of children who ordinarily would have been expected; the increase was attributed to retrolental fibroplasia.[42]

One investigator suggested that a reduction in the large percentage of retrolental fibroplasic school-age children would be expressed after 1960.[43] The reversal, it was alleged, would

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[40] Ibid.

[41] C. Edith Kerby, "Causes of Blindness in Children of School age," Sight Saving Review, 28:19-21, Spring, 1958.

[42] Berthold Lowenfeld, "California: Educational Facilities for the Increasing Number of Blind Children," New Outlook For The Blind, 47:221-222, October, 1953.

[43] C. Edith Kerby, "Causes of Blindness in Children of School Age," Sight Saving Review, 28:17, Spring, 1958.

result from the fact that the incidence of the disease was being so greatly reduced that few new cases were being found.[44] As a result, it was felt that there would be few additions of retrolental fibroplasically blinded children to the school population after 1960.

Studies tended to show some diversity with regard to disease incidence and weight. Owens and Owens reported an incidence of eight per cent for those in the three to four pound category, and sixteen per cent for those weighing less than three pounds.[45] Unsworth reported a thirty-three and one half per cent incidence in his group under three pounds, and thirteen and one third per cent for those three to four pounds.[46] Kinsey and Zacharias showed very dramatic percentage changes in the various weight groups affected by the disease throughout a nine-year period.[47] For a four-year period within their study time, the incidence of retrolental fibroplasia in the three-to four-pound weight group rose from one to twenty per cent.[48] However, other observers reported the incidence for

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[44] Ibid.

[45] William Councilman Owens and Ella Uhler Owens, "Retrolental Fibroplasia," American Journal of Public Health, 40: 406-408, April, 1950.

[46] Holt, op. cit., p. 31.

[47] V. Everett Kinsey and Leona Zacharias, "Retrolental Fibroplasia," Journal of the American Medical Association, 139:573-574, February, 1949.

[48] Ibid.

the three-to four-pound group to be at least as great as that of the lighter weights.[49]

Boston-Lying-In Hospital showed a seventy-three per cent retrolental fibroplasic involvement in a group of eighty-five cases, eight or more weeks premature.[50] Ryan found eighteen of twenty-three cases with the disease ten or more weeks premature.[51] It was, however, interesting to this writer to note reports of the disease in full-term babies. King and Reese commented on such a phenomenon, though Chace and others in their study of one thousand one hundred and fifty-one babies found no evidence of the disease in seven hundred and seventy three full term infants.[52]

Studies containing reference to sex distribution and incidence were found in the literature and investigators reported on the distribution of retrolental fibroplasia sex-wise. Kinsey and Zacharias found a one and four tenths per cent difference between the sexes in the 30.4 per cent affected infants of a population of three hundred and fifty one premature

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[49]William O. La Motte, Jr. and George S. Tyner, "Observations of Retrolental Fibroplasia," Archives of Ophthalmology, 44:623, October, 1950; Zacharias, op. cit., p. 1431.

[50]Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1431, October 1952, citing unpublished data.

[51]Ryan, op. cit., p. 330.

[52]Merrill J. King, "Retrolental Fibroplasia," Archives of Ophthalmology, 43:700, April, 1950; Robert R. Chace, Katherine K. Merritt and Marjorie Bellows, "Occular Findings in Newborn Infants," Archives of Ophthalmology, 44:239-240, August, 1950; Reese, op. cit., p. 540.

cases.[53] However, these same authors found in another population of two hundred and twenty-five retrolental fibroplasic infants more than twice as many affected males as females -- 10.3 per cent of one hundred and six males, and 4.2 per cent of one hundred and nineteen females.[54] This writer noted that Kerby found one hundred and thirty-one blind boys to each one hundred blind girls of school age, whereas the normal sex distribution was one hundred and four sighted males to one hundred sighted females.[55] Zacharias felt that many publications on retrolental fibroplasia failed to include adequate information on sex distribution.[56]

The incidence of the disease where multiple births occurred was treated in the literature. A partial explanation for the reported high incidence of retrolental fibroplasia in multiple birth was that such births were often premature.[57] The factor of prematurity rather than multiplicity of birth appeared to dispose such infants towards the disease.[58]

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[53] Kinsey and Zacharias, op. cit., p. 577.

[54] Ibid.

[55] C. Edith Kerby, "Causes of Blindness in Children of School Age," Sight Saving Review, 28:11, Spring, 1958.

[56] Zacharias, op. cit., p. 1439.

[57] Ryan, op. cit., pp. 330-331.

[58] Ibid.

The disease was mentioned in the professional literature of foreign countries, though its appearance was rare. Boyd and Hirst, using reports from authorities in England and Wales for the year 1951 concerning instances of birth weight of four pounds, six ounces and under, determined that 1.83 per cent of a population of six thousand nine hundred and twenty-six infants had retrolental fibroplasia.[59] Further, they showed that males were more numerous than females in the diseased group and that the incidence of the disease declined sharply with increased birth weights. A report of the Great Britain Medical Research Council for the period October 1, 1951, through May 31, 1953, concerned with one thousand nine hundred ninety-nine infants four pounds of weight or under, showed, for the surviving one thousand and ninety-five, evidence of retinopathy in eighty-four cases with blindness in forty-five or 4.1 per cent cases.[60] It was shown that a larger number of males than females were affected. In explanation it was noted that for any particular birth weight, the males were more immature than the females. In 1950, Moffatt reported twelve per cent of the children in the "Sunshine Homes" in England were blind as a

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[59]J. T. Boyd and R. H. Hirst, "Incidence of Retrolental Fibroplasia in England and Wales in 1951," British Medical Journal, 2:85, July, 1955.

[60]Great Britain Medical Research Council, "Retrolental Fibroplasia in the United Kingdon," British Medical Journal, 2:78-80, July, 1955.

result of retrolental fibroplasia.[61] Zacharias, in her review of the literature on the disease as it was seen in foreign countries, cited reports from Sweden, Italy, Switzerland, Holland, Israel, South Africa, France, Australia, and Cuba.[62]

Comment appeared in the literature regarding the survival of premature infants and the increased incidence of blindness. Silverman noted an improvement of from thirty to fifty per cent in the number of premature infants who survived.[63] However, he also indicated an increase in blindness in the survivors of premature delivery group to the order of at least five hundred per cent.[64] Kinsey and Zacharias also commented on that same fact by remarking that the increase in blindness among infants could not be accounted for solely by the fact that more or a greater number of premature infants were then surviving as opposed to 1942.[65] Those two investigators felt that the survival rate was indeed small as compared to the increased

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[61] "Clinical Aspects of Retrolental Fibroplasia," Proceedings of the Royal Society of Medicine, 43:223, March, 1950, cited by Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1435, October, 1950.

[62] Zacharias, op. cit., pp. 1435-1436.

[63] William A. Silverman, "Symposium: Retrolental Fibroplasia (Retinopathy of Prematurity): Pediatric Considerations," American Journal of Ophthalmology, 40:163, August, 1955.

[64] Ibid.

[65] Kinsey and Zacharias, op. cit., p. 572.

incidence of retrolental fibroplasia.[66] Crosse, in his study of the Birmingham, England, premature infant facility, noted, in a cross comparison with American units, much the same survival rate, yet, a rather large difference in the incidence of the disease.[67] The consensus appeared to be that while the decreased mortality rate among premature infants may have accounted for some of the increase of retrolental fibroplasia, the rise in incidence of the disease was out of proportion to the improved survival rate.[68]

III. LITERATURE ON THE MENTAL DEVELOPMENT OF CHILDREN AFFECTED BY RETROLENTAL FIBROPLASIA

The literature pertaining to the mental development of the child with retrolental fibroplasia appeared to be of two opinions. One opinion was that retardation of mentality resulted as an associated effect of the disease and had a physiological basis, whereas the other opinion was that mental retardation was more apparent than real and would need to be considered in the light of the social and emotional experiences of the child.

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[66] Ibid.

[67] "The Problems of Retrolental Fibroplasia in the City of Birmingham," Tr. Ophthalmology Society of the United Kingdom, 41:611, 1951, cited by Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1437, October, 1952.

[68] Ibid; La Motte and Tyner, op. cit., pp. 620-624; Silverman, loc. cit; Kinsey and Zacharias, op. cit., p. 572.

The first printed reference to the possibility of retarded intelligence in association with retrolental fibroplasia was found in a report issued in 1944, or two years after Terry's initial description of the disease.[69] It was the opinion of the report that a large number of children referred to as "feeble minded" would be expected in the new blind population.

In 1946 Krause referred to children with encephalo-ophthalmic dysplasia, a variety of retrolental fibroplasia, and noted definite mental retardation in ten of a group of seventeen children with the possibility of three additional children being retarded.[70] An extension of these findings was published in 1951 by Krause in conjunction with Hepner and Nardin.[71] At that time, he distinguished retrolental fibroplasia as being of prenatal and postnatal type, with the former characterized by "mental defectiveness" in eighty-two per cent of the cases and the latter by forty-eight per cent.[72]

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[69]Thomas J. Carroll (Chairman), A Report by the Committee on Special Disabilities (Boston: Massachusetts Council of Organizations, 1944), p. 5. (Mimeographed.)

[70]Arlington C. Krause, "Congenital Encephalo-Ophthalmic Dysplasia," Archives of Ophthalmology, 36:440, 1946.

[71]W. R. Hepner, Arlington C. Krause, and Helen E. Nardin, "Retrolental Fibroplasia," Pediatrics, 5:771-782, May, 1950.

[72]Ibid., p. 777.

Szewczyk treated the diagnostic entity congenital encephalo-ophthalmic dysplasia, which he felt differed from the usual retrolental fibroplasia, in terms of time of involvement with anoxia becoming manifest during that period when the central nervous system and eyes were rapidly developing.[73] He felt the organism was particularly vulnerable to injury which might result in mental retardation in a number of such cases.[74]

Ellis, in her study regarding retrolental fibroplasia, commented on the fact that mental retardation was probably greater among premature children than full-term children, and that it would, therefore, be natural for the retrolental fibroplasic group to tend in the direction of intellectual deficiency.[75] Ellis further noted the opinions of one of her interviewees that larger facilities would be needed to accommodate the retarded in the new or retrolental fibroplasic blind population.[76] Barry and Marshall remarked that it had not been uncommon to find apparent retardation accompanying retrolental fibroplasia.[77] Dry pointed to the retrolental

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[73]Thaddeus S. Szewczyk, "Retrolental Fibroplasia: Etiology and Prophylaxis," American Journal of Ophthalmology, 35:301-311, March, 1952.

[74]Ibid., p. 310.

[75]Marion Ellis, "Children with Retrolental Fibroplasia" (unpublished Master's thesis, Hunter College, New York, 1954), p. 8.

[76]Ibid., p. 1.

[77]H. Barry, Jr. and Frances E. Marshall, "Maladjustment and Maternal Rejection in Retrolental Fibroplasia," Mental Hygiene, 37:580, October, 1953.

fibroplasic group as being less "stimulated".[78]

The literature was found to contain references to pseudoretardation in the retrolental fibroplasic population. This retardation appeared, in part, to be related to rejection of the child by a parent. Barry and Marshall present a rather standard case history of and rationale for such rejection.[79] They noted, in essence, that the retrolental fibroplasic child by virtue of its prematurity was placed in an incubator and needed to have other special attentions which only a hospital could provide. The mother was separated from her new-born under two traumatic conditions, one being the premature birth, and the second the enforced separation from the new-born owing to its imperfect physical condition. Under those conditions the mother was unable to provide the food, love, and warmth which she had anticipated giving to her child throughout her period of pregnancy. There was the additional trauma of the mother, on being discharged from the hospital, having to leave her new-born infant there until it was sufficiently independent for survival. Following the separation when the infant was finally brought to the home, there to be particularly demanding on time and energy as a result of its prematurity, the child was subsequently found to be involved visually. The resulting feelings of inadequacy and frustration on the part of the mother

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[78] W. R. Dry, "Oregon: Problems in Connection with Retrolental Fibroplasia," New Outlook for the Blind, 47:226, October, 1955.

[79] Barry and Marshall, op. cit., pp. 576-580.

were expressed in hostility and rejection.[80] Hallenbeck developed a somewhat similar rationale in her treatment of pseudoretardation in the retrolental fibroplasic child.[81] In addition, Norris made the point that emotional disabilities found in association with blindness in children were not usually the result of the blindness but rather occurred through the reaction of society to that condition.[82]

Ellis noted the difficulty which existed with regard to the establishment of healthy attitudes by parents towards their retrolental fibroplasic child. She made special mention of the bewilderment which many parents of such children exhibited.[83]

There appeared to be wide-spread agreement among social scientists with regard to parental attitudes toward the retrolental fibroplasic blind child and to the effect of such attitudes on those children. Such agreement was felt to be well summed up in a conclusion to one of the most thorough and comprehensive studies of blind children which suggested, in reference to the retrolental fibroplasic group, that in the absence of neurological findings of a specific nature, mental

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[80] Ibid.

[81] Jane Hallenbeck, "Pseudoretardation in Retrolental Fibroplasia," New Outlook for the Blind, 48:301, November, 1954.

[82] Miriam Norris, "Some Social Problems Presented by the Increasing Incidence of Blindness Among Children," Outlook for the Blind and Teachers Forum, 45:6, January, 1958.

[83] Ellis, op. cit., p. 22.

retardation could be assumed to result from a complex of social and environmental factors.[84]

A number of investigators expressed opinions with regard to alterations in intellectual functioning once the disturbed inter-personal relationships of the retrolental fibroplasic child had been reviewed and subjected to treatment. Hallenbeck concluded that blindness in and of itself did not cause mental retardation, and that organic brain damage was, in many cases, not a tenable diagnosis, for by improving human contact, the retardation was altered.[85] In a companion study to the above citation, Hallenbeck took special note of the needs of young blind children whom she felt demanded special opportunities for social and sensory stimulation, and required homes especially sympathetic to such needs if development was to be within normal limits.[86] A similar conclusion, the writer felt, could be drawn from Barry and Marshall's study of maternal rejection and poor school adjustment.[87] Norris pointed to the changes in intellectual ability and performance by retrolental fibroplasic children previously subjected to unfavorable environments after

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[84]Miriam Norris, Patricia J. Spaulding, and Fern H. Brodie, Blindness in Children (Chicago: The University of Chicago Press, 1957), p. 65.

[85]Hallenbeck, op. cit., p. 304.

[86]Jane Hallenbeck, "Two Essential Factors in the Development of Young Blind Children," New Outlook for the Blind, 48: 312, November, 1954.

[87]Barry and Marshall, op. cit., pp. 570-580.

exposure to proper education and therapy, and following counseling of parents.[88]

Some notice was given in the literature to the general intellectual level of the retrolental fibroplasic group as a whole. However, such studies, besides being limited in numbers of subjects, were generally confined to the population as it entered the school situation, and, for that reason, dealt with an extremely youthful group. Generalizations were drawn from such restricted data and projected onto the whole retrolental fibroplasic population.[89] Hallenbeck felt the group would tend to show the same distribution of intelligence as would groups blind for other reasons.[90] Ellis expressed an opinion which was substantially the same.[91] Waterhouse, as well as Norris, Spaulding and Brodie, concurred in that opinion.[92]

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[88]Norris, loc. cit.

[89]Jane Hallenbeck, "Two Essential Factors in the Development of Young Blind Children," New Outlook for the Blind, 48: 311-313, November, 1954.

[90]Ibid., p. 312.

[91]Ellis, op. cit., p. 22.

[92]Norris, Spaulding, and Brodie, op. cit., p. 41; Edward J. Waterhouse, "One Hundred and Twenty-fourth Report of the Director," One Hundred and Twenty-fourth Annual Report of the Perkins Institution and Massachusetts School for the Blind (Watertown, Massachusetts: The Eaton Press, 1955), p. 36.

IV. LITERATURE ON THE ACADEMIC ACHIEVEMENT OF THE RETROLENTAL FIBROPLASIC CHILD

The intensive and extensive studies which characterized the work of the medical specialities in their problem solving approach to the disease retrolental fibroplasia were not attempted by educators. This was not to say that concern for the affected group failed to be shown by educators, but merely to state that such concern was not exhibited in terms of well-organized and controlled research.

In commenting on the school experience of a group of sixty-four children, eighty-five per cent of whom were blind as a result of retrolental fibroplasia, Norris, Spaulding, and Brodie noted that their "functioning for their age had been better than that expected of blind children, and sometimes of sighted children of the same chronological age.[93] Further, they said that the twenty-three per cent of the group of sixty-four children who were then six years old were at or above grade placement for their age.[94] The number of retrolental fibroplasic in the twenty-three per cent was not given.

Parmelee, Cutsforth, and Jackson included school adjustment information in their study of the mental development of children blind as a result of retrolental fibro-

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[93] Miriam Norris, Patricia J. Spaulding, and Fern H. Brodie, Blindness in Children (Chicago: The University of Chicago Press, 1957), pp. 63-64.

[94] Ibid.

plasia.[95] Though the study contained a population of thirty-eight retrolental fibroplasics, education information was not presented in a uniform manner, nor was it noted in a fashion which allowed for statistical analysis.[96] While eleven of the group of thirty-eight were classified as mentally retarded, an additional seven of the population were felt to have demonstrated "poor" or "slow" progress in the educational situation.[97] The remainder of the population appeared to have made "satisfactory" to "excellent" school adjustment. Such terms as "poor", "slow", "satisfactory", and "excellent" were not defined.

V. LITERATURE ON THE ETIOLOGY, PROPHYLAXIS, AND PRESENT STATUS OF RETROLENTAL FIBROPLASIA

The efforts of medical scientists and investigators were directed through the years towards a variety of environmental, physical, chemical, and nutritional factors in an intensive attempt to understand, delimit, and control retrolental fibroplasia.

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[95] Arthur H. Parmelee, Jr., Margery Gilbert Cutsforth, and Claire L. Jackson, "Mental Development of Children with Blindness Due to Retrolental Fibroplasia," American Medical Association Journal of Diseases of Children, 96:642-654, December, 1958.

[96] Ibid., pp. 646-650.

[97] Ibid.

The effect of diet on the development of the disease attracted attention in the literature. Krause felt that those hospital nurseries in which cow's milk formula was used in feeding had the highest incidence of retrolental fibroplasia.[98] In at least one hospital where such a formula was used solely, the incidence of the disease was high.[99] It was, however, noted in another hospital where the same type of milk was used in feeding, no cases occurred.[100] Zacharias commented on the confusion which resulted from incomplete reports of diets. She felt that a precise definition of diet as well as pediatric routine was essential if data was to have meaning insofar as comparability was concerned.[101] Various investigators concluded from available data that the incidence of retrolental fibroplasia did not appear to be affected by

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[98] Arlington C. Krause, "Etiology of Retrolental Fibroplasia," American Journal of Ophthalmology, 34:1006, July, 1951.

[99] Franklyn P. Bousquet, Jr. and William E. Laupus, "Studies on the Pathogenesis of Retrolental Fibroplasia," American Journal of Ophthalmology, 35:64-65, May, 1952.

[100] L. Emmett Holt, Jr. (Chairman), A Conference on Retrolental Fibroplasia, Report of the Second Ross Pediatric Research Conference (Columbus, Ohio: M and R Laboratories, 1951), pp. 33-34.

[101] Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1441, October, 1952.

either cow's milk or human breat milk.[102]

The question of the effect on the development of the disease in cases of early feeding of the infant as opposed to withholding food for a period of time was not settled in the literature at the disposal of the writer. The literature conflicted so extensively that no general conclusions were possible.[103]

The effect of amount and intensity of light as it was involved in the development of the disease was studied. Ryan felt that light was not an etiological factor and Zacharias noted no change in incidence during the period when ophthalmological examinations with accompanying illumination were a by-weekly occurrence in a nursery.[104] Hepner, Krause, and Nadine, however, reported the disease developed in four of a group of five infants whose eyes were covered from birth.[105] Conversely, Crosse reported retrolental fibroplasia in four infants, three of whom had been exposed to light while the

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[102]V. Everett Kinsey and Leona Zacharias, "Retrolental Fibroplasia," Journal of the American Medical Association, 139:578, February, 1949; William O. La Motte, Jr. and George S. Tyner, "Observations of Retrolental Fibroplasia," Archives of Ophthalmology, 44:621, October, 1950.

[103]Zacharias, op. cit., p. 1441; La Motte, Jr. and Tyner, op. cit., pp. 621-623.

[104]Hugh Ryan, "Retrolental Fibroplasia," American Journal of Ophthalmology, 35:335, March, 1952; Zacharias, op. cit., p. 1440.

[105]W. R. Hepner, Arlington C. Krause, and M. Edward Davis, "Retrolental Fibroplasia and Light," Pediatrics, 3:827, May, 1949.

fourth had been protected.[106]

The use of blood transfusions for uneffected and effected premature infants was also treated in the literature. While the development of the disease was noted where transfusions were used, the consensus appeared to be again the relationship of that procedure to the incidence of the disease.[107]

Considerable attention was given to the question of vitamin E deficiency as it was involved in the development of retrolental fibroplasia. It appeared to the writer from the literature that this factor neither hindered the development of the disease nor retarded its progress.[108]

An additional number of chemical, biological, and physical agents were also investigated for their possible relationship to the disease. Reese was concerned with the role of virus as an infectious agent.[109] The possibility of

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[106] "Retrolental Fibroplasia," Proceedings of the Royal Society of Medicine, 43:232, March, 1950, cited by Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1440, October, 1950.

[107] Zacharias, op. cit., pp. 1441-1442.

[108] Franklyn P. Bousquet and William E. Laupus, "Studies on the Pathogenesis of Retrolental Fibroplasia," American Journal of Ophthalmology, 35:64-68, May, 1952; V. Everett Kinsey and Julian F. Chisholm, "Retrolental Fibroplasia," American Journal of Ophthalmology, 34:1267, September, 1951.

[109] A. B. Reese, "Retrolental Fibroplasia," American Journal of Ophthalmology, 31:624-625, May, 1948.

a hormonal imbalance was pursued by La Motte, Tyner, and Scheie.[110] The role of the maternal organism insofar as a lack of vitamin A effected the occular development of the offspring engaged Clifford and Weller.[111] These various agents were eliminated, however, as possible etiological factors in the development of retrolental fibroplasia.

From 1942, when retrolental fibroplasia was described, until 1949, intensive study and investigation produced nothing of substance which could be utilized to prevent or ameliorate the disease. Perhaps the most poignant admission of frustration was made by Dr. Merrell J. King in an address to a meeting of parents of blind children when he suggested that hospitals, in the attempt to eradicate the disease, were going back to pediatric schedules of 1939 and before when the disease was largely unknown.[112]

Commencing in 1949, certain factors began to make themselves known both in the United States and abroad. Kinsey and Zacharias in a detailed and intensive study of incidence and the correlation of retrolental fibroplasia with nineteen variables involving the maternal organism and/or the premature

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[110] William O. La Motte, Jr., George S. Tyner, and Harold G. Scheie, "Treatment of Retrolental Fibroplasia with Vitamin E, Corticotropin (ACTH), and Cortisone," Archives of Ophthalmology, 47:556-569, May, 1952.

[111] Stewart H. Clifford and Kathleen Fahey Weller, "Absorption of Vitamin A in Prematurely Born Infants," Pediatrics, 1:505-511, April, 1948.

[112] Address by Dr. M. J. King at a meeting of Parents of Blind Children, Boston, October, 18, 1951. (Mimeographed.)

infant, found a significant correlation between the development of the disease and the length of time the infant remained exposed to oxygen in the incubator.[113] A report by Ryan indicated the appearance of cases of the disease in Melbourne, Australia, only after efficient incubators were introduced with oxygen being administered to all premature infants as a matter of course.[114] No further cases of the disease were reported after the restriction of oxygen to those infants who were actually cyanosed. Campbell, also reporting on Australia, noted significant differences in hospital nurseries administering oxygen either liberally or in a more controlled fashion when incidence comparisons were made.[115] Szewczyk wrote at length on the disease in its relation to oxygen and developed a rationale predicted on high oxygen administration with rapid withdrawal as causing retrolental fibroplasia.[116]

Though the role of oxygen appeared to take on more importance in the literature, it was not always cast as the etiological agent in retrolental fibroplasia. Contrary to this, at least one hospital -- New Orleans Charity Hospital --

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[113] Kinsey and Zacharias, op. cit., pp. 574-578.

[114] Ryan, op. cit., pp. 335-336.

[115] "Intensive Oxygen Therapy as a Possible Cause of Retrolental Fibroplasia: A Clinical Approach," Medical Journal of Australia, 2:48-50, July, 1951, cited by Leona Zacharias, "Retrolental Fibroplasia: A Survey," American Journal of Ophthalmology, 35:1444, October, 1952.

[116] Thaddeus S. Szewczyk, "Retrolental Fibroplasia: Etiology and Prophylaxis," American Journal of Ophthalmology, 34:1649-1650, December, 1951.

which used oxygen liberally, reported no cases of the disease.[117] Also, Szewczyk was of the opinion that oxygen was actually a curative or at least an ameliorating agent in the disease.[118]

However, through the years the weight of etiological responsibility appeared to shift from a variety of possibilities to what appeared to be a statistical and experimental certainty. Patz produced retrolental fibroplasia in the eyes of animals through the use of excessive oxygen.[119] Hepner was likewise successful in that regard, as well as was Ashton and also others in both England and Scandinavia.[120]

Longitudinal studies appeared which seemed to confirm the role of oxygen in the disease. Patz commented on the etiological role of oxygen in an initial report of a three-year nursery study.[121] Kinsey and Hemphill reported on an

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[117] L. Emmett Holt, Jr. (Chairman), A Conference on Retrolental Fibroplasia, Report of the Second Ross Pediatric Research Conference (Columbus, Ohio: M and R Laboratories, 1951), pp. 32-36.

[118] Szewczyk, loc. cit.

[119] L. J. Filer, Jr. (comp.), Retrolental Fibroplasia: Role of Oxygen, Report of the Sixteenth M and R Pediatric Research Conference (Columbus, Ohio: M and R Laboratories, 1955), pp. 11-17.

[120] Ibid., pp. 23-33; Norman Ashton, Basil Ward, and Godfrey Serpell, "Role of Oxygen in the Genesis of Retrolental Fibroplasia," British Journal of Ophthalmology, 37: 513-520, September, 1953; Lars J. Gyllensten and B. E. Hellestrom, "Retrolental Fibroplasia: Animal Experiments," ACTA Pediatrics, 41:577-582, November, 1952.

[121] Arnall Patz, "Studies on the Effect of High Oxygen Administration in Retrolental Fibroplasia: Nursery Observations," American Journal of Ophthalmology, 35:1248-1253, September, 1952.

intensive study which included statistics from eighteen hospitals east of the Rocky Mountains.[122] Both of these studies showed through control and experimental groups the dilatory effect of oxygen on the premature infant insofar as it contributed to the development of retrolental fibroplasia. That conclusion was supported by additional reports and studies published in increasing numbers after 1950, until, in 1955, Reese, at the conclusion of a symposium on retrolental fibroplasia, was able to state, "All theories concerned with the etiology of retrolental fibroplasia excepting that concerned with oxygen have failed of confirmation."[123]

It appeared that the cause of the disease had at last been determined and that a more rational use of oxygen was indicated as a means of eliminating the disease which had become the largest single agent of blindness among children. The work of Patz showed that prolonged high oxygen levels were productive of more advanced damage grades to the eyes than lower oxygen levels.[124] Kinsey and Hemphill demonstrated the much higher incidence of both active and cicatrical phases

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[122]V. Everett Kinsey and F. M. Hemphill, "Etiology of Retrolental Fibroplasia: Preliminary Report of a Cooperative Study of Retrolental Fibroplasia," American Journal of Ophthalmology, 40:166-174, August, 1955.

[123]Algernon B. Reese, "Symposium: Retrolental Fibroplasia (Retinopathy of Prematurity): Conclusions," American Journal of Ophthalmology, 40:186, August, 1955.

[124]Arnall Patz, "Symposium: Retrolental Fibroplasia (Retinopathy of Prematurity): Experimental Studies," American Journal of Ophthalmology, 40:174-183, August, 1955.

of retrolental fibroplasia in premature infants of three pounds and five ounces or less assigned to an oxygen formula of fifty per cent concentration for twenty-eight days as opposed to a matched group given oxygen only on a basis of clinical need.[125]

In response to a number of such studies, hospitals reversed pediatric procedures for premature infants with the result that the incidence of retrolental fibroplasia changed perceptively. Kerby was able to state that the number of new cases of blindness due to retrolental fibroplasia was being very substantially altered.[126] Further, on the basis of data obtained from state agencies in 1954-55, she felt that the blind pre-school population would be reduced to pre-retrolental fibroplasic levels after 1960.[127] In effect, the disease was conquered.

Retrospectively it seemed that possible reasons for the development of retrolental fibroplasia could be constructed. In such a comment as that of retrolental fibroplasia being a

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[125]V. Everett Kinsey and F. M. Hemphill, "Symposium: Retrolental Fibroplasia (Retinopathy of Prematurity): Etiology of Retrolental Fibroplasia," American Journal Ophthalmology, 40:166-173, August, 1955.

[126]C. Edith Kerby, "Causes of Blindness in Children of School Age," Sight Saving Review, 25:17, Spring, 1958.

[127]Ibid.

disease of prosperity lay some basis for hypothesizing.[128] Money was generally severely restricted in the decade prior to 1940. While the role of oxygen in the maintenance of life was then known, it was because of its expense, resorted to only in cases of dire emergency. As a result, only those premature infants who were in danger of expiring were exposed to oxygen. It has further hypothesized that with money more readily available after 1940, expense was of little concern in giving "help" to the premature infant. Such help was provided in the form of liberal and prolonged exposure to oxygen, whether needed or not. At the time, hospitals had the equipment and people were able to afford the additional expense. However, more contemporary knowledge and experience showed that what was well intended produced, in part, a negative result; survival with disability.

Another hypothesis for the development of retrolental fibroplasia was that better designed incubators which retained more oxygen were available after 1942.[129] The result was a continuing high level of oxygen with little possibility of its level being lowered through natural escape as had been the case in the more primitive incubators. In addition, the oxygen

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[128]Opinion expressed by Daisy Prentice, Division of Child Health Services, Montana State Board of Health, personal interview, Billings, Montana, November 4, 1958.

[129]Ibid., Thaddeus S. Szewczyk, "Retrolental Fibroplasia: Etiology and Prophylaxis," American Journal of Ophthalmology, 35:303, March, 1952.

analyzer was not in general use until after 1948.[130]

A further hypothesis for the development and spread of the disease was that inadequate and sometimes poorly prepared personnel staffed civilian hospitals in the years 1942 to 1946 and, also, the extreme shortage of adequate personnel for the years directly after the Second World War made rigid supervision and control of pediatric procedures in hospitals unlikely. The possibility of mismanagement of equipment served as a correlary to the hypothesis of inadequate and poorly prepared personnel.[131]

Though additions to the retrolental fibroplasic population were made with much less frequency, it seemed likely that the disease would remain endemic at a very low incidence in the population of premature infants. Such an observation was made and appeared plausible when consideration was given to the fact that some premature infants may have respiratory difficulties which, if life were to be sustained, would require oxygen.[132] While the level of oxygen could be held at the minimum amount needed for survival and, in effect, reduce the possibility of the disease, it would not remove all possibility.

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[130] Prentice, loc. cit.

[131] Ibid.

[132] Opinion expressed by Dr. William E. Butler, personal interview, Billings, Montana, August 21, 1959.

In addition, poor pediatric management, it was felt, could add additional numbers to the retrolental fibroplasic blind population.

VI. LIMITATIONS OF PREVIOUS STUDIES

A thorough study of the human organism usually involves the four broad areas of human activity designated as physical, social, emotional, and intellectual. While these areas are not mutually exclusive, there appear to be certain human activities which can best be understood when qualified in such a manner. This scheme imposes a type of order on the study of the human organism.

Medical studies. The research having to do with retrolental fibroplasia insofar as it considered the nature, cause, course, and prophylaxis of the disease was clear and unequivocal. The basis for such a statement lay in the fact that the incidence of retrolental fibroplasia among pre-mature infants was greatly reduced. The larger implications of the disease insofar as they suggest the possibility of neurological complications as a result of excessive oxygen remained, from a physiological standpoint, essentially unanswered.

Social and psychological studies. Studies regarding the emotional and social characteristics of the retrolental fibroplasic child were important within their limited range. Those studies, having to do with the effects of parental rejection, the need of the blind child for active participation

in his environment, and exposure to new and challenging environments, were widely utilized. The limited literature showed the successful result of adherence to the findings of the social and psychological research. Unfortunately, there were no intensive follow-up studies of children and parents who were known to have benefited through counseling, psychological services, and environmental manipulation. Further, studies were largely concerned with and restricted to pre-school and nursery school retrolental fibroplasic children and their families. The emotional and social behavior of the older retrolental child was not treated in the literature at the disposal of the writer.

Intellectual and academic studies. Studies relating to the intellectual functioning of the retrolental fibroplasic child were limited. Such studies as were done compared the results of retrolental fibroplasic blind children on intelligence tests with those scores obtained by blind children usually designated as "other".[133] Such gross comparisons added little of significance to the understanding of mental development of the retrolental fibroplasic group. The "other"

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[133]Miriam Noris, Patricia J. Spaulding, and Fern H. Brodie, Blindness in Children (Chicago: University of Chicago Press, 1957), pp. 3-67; Samuel P. Hayes, First Regional Conference on Mental Measurement of the Blind (Watertown, Massachusetts: Perkins Institution and Massachusetts School for the Blind, 1952), pp. 27-30; Waterhouse, op. cit., p. 28.

population might well have contained children whose blindness was associated with neurological impairment, as, for instance, in the case of cataracts resulting from rubells in the maternal organism. This, as well as other diagnostic categories, could have appreciably influenced a true understanding of the intellectual status of the retrolental fibroplasic group. In addition, there were no studies which systematically investigated the academic performance of the retrolental fibroplasic child as an aspect of intellectual performance. Further, there were no studies which thoroughly compared the academic performance of the retrolental fibroplasic group with that of other specific diagnostic groups. In addition, those studies which were at all concerned with information regarding academic functioning were limited in populations, restricted as to grade level, and constricted in the amount, variety, and statistical nature of their data and conclusions.

SUMMARY

It was shown through the literature that a particular infant population was especially susceptible to a disease known as retrolental fibroplasia. It was further demonstrated that blindness, a sensory deficit, was the result of the disease in certain cases, and that several unique stages of the disease were distinguishable. Further, it was shown that retrolental fibroplasia was erratic as regarded incidence and geographical location, age, population affected weight of

affected population, gestational age, skin pigmentation, and time of onset. In addition, a variety of opinions regarding intellectual ability, psychological integrity, psycho-social, environmental and developmental characteristics were considered.

The question of causation in the development of retrolental fibroplasia was presented, as well as a consideration of prophylaxis. Additional cognizance was taken of conjectural opinions concerning the development, extension, and future status of the disease. The limitations of previous studies concerned with the physical, social, emotional, and intellectual aspects of the specialized population were noted.

CHAPTER III

THE MATERIALS USED AND GROUPS STUDIED

The purpose of this study was to attempt to define more adequately the character of retrolental fibroplasic children by comparing the academic and intellectual achievement as well as social performance of retrolental fibroplasic school-age children with that of their peers visually involved for a variety of other reasons.

I. THE MATERIALS

A number of possible study population sources were considered. The various groups could have been selected from public day schools having classes for the blind, from both day schools and residential schools for the blind, from a single residential school, or from a number of such schools. The final selection was made after examining each possibility in the light of a number of questions. Were sufficient numbers of students available from the source? Was the academic curriculum uniform? Had psychometric evaluations of intelligence been made and were they reasonably uniform? Was there comparable social exposure? Was academic achievement evaluated, and if so, how often and by what means? Were ophthalmological reports available? Was the teaching system standardized? After evaluating all the possible population sources, the writer concluded that each had its weakness, but

that the single residential school population most closely satisfied the demands of the study's structure.

The population was chosen from students in attendance at the Perkins School for the Blind, Watertown, Massachusetts. This choice was made because the administration had maintained their standard academic testing program on a specific schedule for the period of the study; the school trained its own teachers, and, as a result, insured a single teaching system if not a single standard of teaching; the Guidance Committee and Department remained constant for the period; reasonably uniform psychometric evaluations were insured through minimum personnel changes in the testing staff; the academic curriculum remained constant; the social milieu was not characterized by any vast changes; academic records of subjects were available for statistical analysis; ophthalmological records were available; and, the administration supported and encouraged the study.

Academic achievement tests and measures. Achievement was measured in the population of this study both by tests and by teacher evaluation. The Stanford Achievement Test was administered in October of each of the four years occupied by this study excepting 1956, when the testing extended into November. Prior to 1956 evaluation by that particular instrument commenced at the fourth grade level. However, in 1956 the lower limit was extended to include the third grade. Four forms of the test, E, F, J, and K, were used. Forms E and F

were adapted for use by the blind and semi-sighted by Hayes, and published in 1952.[1] Forms J and K were also adapted by Hayes and published in 1956.[2]

The adaptations of the Stanford Achievement Test necessary to accommodate the visually involved population consisted of the lengthening of the time limit to approximately two and one-half that required by a sighted population on certain sub-tests, the reading by the examiner of all directions and questions, certain word changes in the directions to accommodate the Braille technique of tactile reading, and the division of certain tests into two sections since the Braille time allowance introduced the element of fatigue. When such divisions were made, alternate items were introduced in most cases so that achievement of the same level could be expected from either half.[3]

The achievement tests contained the following seven sub-tests: (1) reading, (2) word meaning, (3) language usage, (4) arithmetic reasoning, (5) social studies, (6) science, and (7) spelling. All grades in the range considered in the study were given the seven sub-tests excepting the Third and Fourth

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[1]Truman L. Kelley, Giles M. Ruch and Lewis M. Terman, Stanford Achievement Test (New York: World Book Company, 1940), adapted for use with the Blind and Partially Seeing by Samuel P. Hayes, 1952. (mimeographed)

[2]Truman L. Kelley and others, Stanford Achievement Tests (New York: World Book Company, 1953), Adapted for use with the Blind and Partially Seeing by Samuel P. Hayes, 1956.

[3]Ibid., pp. 1-2.

Grades, and Special Class, which, owing to the nature of their curriculum, were not tested in either science or social studies.

Teacher evaluation of student academic progress was the second type of achievement considered in this study. Such evaluations were made in the form of periodic reports or scores which, as standardized letter grades, were entered on the student's scholastic record. The academic grade scores were designated by the letters A through F, excluding E, in descending order of excellence with intermediate gradation points of plus or minus. The numerical translation of those letter grade scores on the basis of a possible total of one hundred points indicated a range differential of seven and one-half points, which was apparently rounded off for the sake of administrative convenience. For this study, only the final academic grade scores for each of those years included in the study were tabulated. However, for the year 1957-58 the final first term grade scores for each academic subject was substituted, as the terminal marks were not available to the writer.

The academic subject areas for which grade scores were tabulated were (1) science, (2) social studies, (3) spelling, (4) arithmetic, (5) reading for meaning and comprehension, (6) and writing. Writing was concerned with the application of generalized grammatical and identional skills rather than mechanics, per se.

Teacher evaluation of Conduct and Effort was also tabulated. The scheme of such an evaluation was of the same order as that for academic achievement, with the exception that the

numerical counterpart for letter designations did not appear to be so well defined. It was the writer's feeling that the subjective nature of evaluations of conduct and effort disallowed any precise numerical representation.

Intelligence tests. Tested intelligence was also considered in this study with such information being derived from the administration of one of the following three scales: (1) the Interim-Hayes Binet Intelligence Test for the Blind, 1942, (2) Wechsler Intelligence Scale for Children, (3) Wechsler Adult Intelligence Scale.

The Interim-Hayes Binet, an adaptation of the 1937 Terman-Merrill revision of the Stanford-Binet Test, was developed through the consideration of all items of the L. and M. series, Terman-Merrill revision, which could be given to a non-sighted population. Age groups of items were assembled with six tests for each age group from seven upward. For the years three to six it was necessary to include items from the Hayes-Binet Scale of 1930, owing to the fact that so many items in that age range on the 1937 revision of the Stanford-Binet Test required vision.[4] The validity and reliability of the adaptation was treated in the literature.[5]

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[4]Samuel P. Hayes, "Alternative Scales for the Mental Measurement of the Blind," Outlook for the Blind, 36:225-230, April, 1942; Samuel P. Hayes, "A Second Test Scale for the Mental Measurement of the Visually Handicapped," Outlook for the Blind, 37:37-41, January, 1943.

[5]Samuel P. Hayes, "Measuring the Intelligence of the Blind," Blindness, Paul A. Zahl, editor (Princeton: Princeton University Press, 1950), pp. 145-157.

Alteration of both the Wechsler Scales consisted of the elimination of the performance aspect of those tests with the result that they could be administered to a non-sighted population almost without change.[6] The validity and reliability of these adaptations were in the process of being determined.[7]

Many of the subjects in the study's population had had several intelligence tests, owing to the fact that the school administration maintained a policy of periodic intellectual evaluation. However, for the purpose of this study, only the most recent test score was tabulated. A numerical value or Intelligence Quotient was obtained for each testee's performance, and this value was, in turn, treated for enumeration by placement in one of the seven categories of intelligence developed by Wechsler.[8] The categories were: Very Superior, I.Q. 130+; Superior, I.Q. 120-129; Bright-Normal, I.Q. 110-119; Average, I.Q. 90-109; Dull-Normal, I.Q. 80-89; Borderline, I.Q. 70-79; and Mentally Defective, I.Q. 69-.

Data on diagnostic groupings. The diagnostic groups as they pertain to optic pathology and to the multiply handicapped

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[6]Statement by Carl Davis, Head, Psychology and Research Department, Perkins School for the Blind, personal interview.

[7]Ibid.

[8]David Wechsler, Wechsler Intelligence Scale for Children (New York: The Psychological Corporation, 1949), p. 16.

were constructed from information contained in the subject's ophthalmological records and other medical reports and from the files of staff therapists. Seven categories of optic pathology were developed with an additional category for cases with limited numerical representation or uncertain diagnosis. The diagnostic groups consisted of: (1) retrolental fibroplasia, (2) cataracts, (3) retinitis pigmentosa, (4) buphthalmus/glaucoma, (5) optic atrophy, (6) amblyopia, (7) retinoblastoma, (8) other (as defined in Chapter I).

The multiply handicapped diagnostic group consisted of visually involved subjects with associated handicaps which necessitated some type of therapy or control medication, other special physical service, or combination of physical services. The seven categories of multiple handicap were: (1) cerebral palsy, (2) speech handicap, (3) epilepsy; (4) diabetes, (5) auditory handicap, (6) arthritis, (7) combination of cerebral palsy and speech handicap.

Data on guidance referrals. Information pertaining to guidance referrals as well as to the number, type, and disposition of such referrals was supplied by the Psychology and Research Department of the Perkins School. Agenda of the Guidance Committee were made available to the writer by the Psychology and Research Department, with interpretations of the recommendations by Committee given through the Head, Psychology and Research Department.

Owing to the fact that the number of referrals to the

Guidance Committee of any given subject was not enumerated on any record, it was deemed advisable at the suggestion of the Head, Psychology and Research Department, to calculate referrals on the basis of the appearance of any subject's name within two consecutive Guidance Committee's agendum as one referral. More explicitly, it was necessary for there to be an intervening agendum without the subject's name for two referrals to be counted.

Types of guidance referrals were divided into nine categories as follows: (1) family, (2) physical behavior including peer relationships, (3) scholastic, (4) physical, (5) the combination family and behavior including peer relationships, (6) the combination family and scholastic, (7) the combination scholastic and physical, (8) the combination behavior including peer relationships and physical, (9) the combination behavior including peer relationships and scholastic. These categories were symptomatic rather than diagnostic in nature. It was realized that the various categories were not in and of themselves exclusive, and that any given subject might react in a fashion which could include all of the categories of guidance referrals. However, insofar as it was within the ability and competence of the Head, Psychology and Research Department, to present the basis for the guidance referral, it was accomplished in terms of the above scheme.

II. GROUPS STUDIED

Because of the nature of the study, the population was

divided into a number of groups and subgroups. The broadest divisions were those of the diagnostic categories, retrolental fibroplasia and composite. Composite referred to the remainder of the population not visually involved as a result of retrolental fibroplasia. In order to facilitate comparisons, the population was, in addition, divided into such groups as the Visual Response Group, Special Class Group, Multiply Handicapped Group, Superior Intelligence Group, the Intensive Grade Range Group, and additional groups which contained subjects having a common diagnosis of optical pathology.

The data from which the subgroups were derived are shown in Table I. The body of the table consisted of the computer print-out and each arabic numeral referred to one of the divisions within the type of information which was compiled, i.e., under sex, number one indicated males and number two, females. The coding system used in the compilation and contained in the computer print-out is illustrated in Figure 2 of the Appendix.

TABLE 1

DATA ON THE 168 SUBJECTS IN THE STUDY POPULATION*

Number	Sex	Age	Grade	Diagnosis	Section	Retrolental Fibroplasia/No	Visual Acuity	Additional Handicap	Type of Additional Handicap	Guidance Referral	Number of Referrals	Type of Referrals	Referral Disposition	Intelligence Quotients	Conduct	Effort
1	1	10	5	1	4	1	2	2	0	1	0	1	3	9	4	2	2
2	1	14	6	1	2	1	2	2	0	2	0	0	0	0	1	1	1
3	1	11	2	4	1	2	2	2	0	1	0	1	2	4	0	2	2
4	1		13	8	3	2	2	2	0	0	0	0	0	0			
5	1	10	5	1	3	1	2	2	0	2	0	0	0	0	3	2	2
6	1	13	7	1	4	1	2	1	3	1	0	1	9	1	4	1	1
7	1	13	7	5	4	2	1	1	1	2	0	0	0	0	3	2	2
8	2	25	13	8	3	2	2	1	2	1	0	1	4	4	3		
9	1	11	5	1	3	1	2	2	0	1	0	3	5	2	2	2	2
10	1	14	7	4	3	2	2	2	0	2	0	0	0	0	3	2	3
11	1	14	7	2	3	2	1	2	0	1	0	1	2	2	2	1	2
12	1	10	2	6	1	2	1	2	5	1	0	6	3	2	1	2	2
13	1	14	5	4	3	2	1	2	0	1	0	2	9	2	2	2	2
14	1	11	4	8	3	2	1	2	0	2	0	0	0	0	3	3	3
15	2	11	4	1	3	1	2	2	0	2	0	0	0	0	3	3	3
16	1	14	6	5	3	2	2	1	7	1	0	2	7	2	2	2	2
17	2	13	8	1	3	1	2	2	0	1	0	1	2	2	3	1	1
18	1	13	5	5	3	2	2	1	2	2	0	0	0	0	1	2	2
19	1	13	7	2	4	2	1	2	0	2	0	0	0	0	6	1	2
20	2	13	8	8	3	2	1	2	0	2	0	0	0	0	2	1	1
21	2	13	7	1	3	1	2	2	0	2	0	0	0	0	3	2	1
22	1	10	4	5	3	2	1	1	1	1	0	3	2	2	3	0	
23	1	14	8	1	4	1	2	1	2	1	0	2	9	6	4	2	2
24	1	10	4	1	3	1	2	1	2	2	0	0	0	0	2	3	3
25	2	12	6	1	4	1	2	2	0	2	0	0	0	0	4	2	3
26	1	14	7	1	4	1	2	2	0	1	0	1	2	2	3	2	1
27	2	16	10	1	4	1	2	2	0	2	0	0	0	0	5	3	3
28	1	25	14	8	3	2	2	1	4	2	0	0	0	0			

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TABLE 1 (continued)

Number	Sex	Age	Grade	Diagnosis	Section	Retrolental Fibroplasia/No	Visual Acuity	Additional Handicap	Type of Additional Handicap	Guidence Referral	Number of Referrals	Type of Referrals	Referral Disposition	Intelligence Quotients	Conduct	Effort
29	1	13	6	1	2	1	2	2	0	2 0	0	0	0	1	2	2
30	1	15	7	1	3	1	2	2	0	2 0	0	0	0	3	2	2
31	1	12	5	1	3	1	2	2	0	1 0	1	2	1	0	2	2
32	2	13	6	4	2	2	1	1	7	1 0	3	4	4	2	2	2
33	1	13	7	1	4	1	2	2	0	2 0	0	0	0	4	2	1
34	1	15	6	4	2	2	1	2	0	2 0	0	0	0	3	2	2
35	2	13	7	4	3	2	1	2	0	2 0	0	0	0	3	3	1
36	2	14	7	2	4	2	2	2	0	2 0	0	0	0	4	2	3
37	1	16	8	2	4	2	1	2	0	1 0	7	2	6	4	1	1
38	1	20	13	6	3	2	1	2	0	2 0	0	0	0	6		
39	1	10	4	1	4	1	2	2	0	2 0	0	0	0	3	2	1
40	2	15	9	2	3	2	1	2	0	2 0	0	0	0	3	3	2
41	1	11	6	4	3	2	2	2	0	2 0	0	0	0	4	1	2
42	1	16	9	8	3	2	2	2	0	2 0	0	0	0	3		
43	2	08	3	8	3	2	2	2	0	2 0	0	0	0	3	1	1
44	1	11	4	8	4	2	1	2	0	1 0	2	5	2	3	3	3
45	1	13	8	1	4	1	2	2	0	2 0	0	0	0	4	3	2
46	2	13	7	1	3	1	2	2	0	2 0	0	0	0	3	3	2
47	2	15	9	8	3	2	1	2	0	2 0	0	0	0	2		
48	1	11	6	1	3	1	2	1	2	2 0	0	0	0	3	2	2
49	1	12	6	1	4	1	2	2	0	1 0	1	1	2	4	2	2
50	2	12	5	1	3	1	2	2	0	2 0	0	0	0	2	2	1
51	1	14	8	7	4	2	2	2	0	10	1	4	4	6	2	2
52	2	15	8	1	3	1	2	2	0	1 0	2	3	2	3	2	3
53	2	14	8	1	4	1	2	2	0	1 0	2	5	7	3	1	2
54	2	17	12	1	4	1	2	2	0	2 0	0	0	0	6	3	3
55	2	15	7	2	1	2	1	2	0	1 0	2	2	6	1	2	1
56	1	16	9	8	3	2	1	1	2	2 0	0	0	0	2		
57	2	17	12	1	4	1	2	2	0	2 0	0	0	0	4	3	3
58	1	09	4	1	4	1	2	2	0	2 0	0	0	0	6	3	2
59	1	09	3	2	3	2	1	2	0	1 0	3	5	2	3	3	3
60	2	10	4	1	3	1	1	2	0	2 0	0	0	0	3	2	3

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TABLE 1 (continued)

Number	Sex	Age	Grade	Diagnosis	Section	Retrolental Fibroplasia/Nc	Visual Acuity	Additional Handicap	Type of Handicap	Guidance	Number of Referrals	Type of Referrals	Referral Disposition	Intelligence Quotients	Conduct	Effort
61	2	16	8	1	4	1	1	2	0	2	0	0	0	0	3	2	2
62	1	11	6	1	4	1	2	2	0	2	0	0	0	0	5	2	2
63	2	13	7	1	1	1	2	1	7	1	0	3	4	2	1	2	1
64	2	10	3	8	3	2	1	2	0	1	0	1	8	7	2	1	1
65	2	12	6	1	4	1	2	2	0	2	0	0	0	0	4	2	2
66	2	15	8	1	3	1	1	2	0	1	0	1	1	2	3	2	2
67	2	18	13	1	3	1	2	2	0	2	0	0	0	0	5		
68	1	14	7	6	1	2	1	1	3	1	0	2	0	2	2	2	2
69	2	14	8	8	3	2	1	2	0	2	0	0	0	0	2	3	3
70	2	09	4	1	3	1	2	2	0	1	0	5	5	7	3	0	1
71	2	12	7	1	3	1	1	2	0	2	0	0	0	0	4	2	1
72	1	15	9	3	4	2	1	2	0	1	0	1	2	1	3		
73	1	10	4	2	4	2	1	2	0	2	0	0	0	0	3	2	3
74	2	15	8	1	3	1	1	2	0	1	0	1	6	6	3	2	2
75	1	11	6	4	4	2	1	2	0	2	0	0	0	0	5	2	3
76	1	12	2	4	1	2	2	2	0	1	0	5	5	3	0	2	1
77	2	11	6	1	3	1	2	1	1	1	0	1	1	3	3	2	3
78	2	14	7	2	1	2	2	1	2	1	0	2	9	2	1	3	2
79	1	14	8	7	4	2	2	2	0	1	0	2	5	3	6	2	2
80	1	14	6	1	2	1	2	2	0	1	0	1	1	2	2	2	3
81	2	20	13	2	3	2	1	1	2	2	0	0	0	0	3		
82	1	10	4	1	3	1	2	2	0	2	0	0	0	0	3	3	3
83	1	21	13	8	3	2	2	2	0	1	0	3	3	9	4		
84	2	17	12	3	3	2	1	2	0	2	0	0	0	0	3	3	3
85	1	18	12	6	4	2	2	2	0	1	0	5	5	1	3	3	3
86	2	13	5	1	3	1	2	2	0	2	0	0	0	0	0	3	2
87	2	10	3	1	3	1	2	2	0	2	0	0	0	0	3	3	3
88	2	11	6	1	3	1	2	2	0	2	0	0	0	0	3	3	2
89	1	13	6	1	2	1	1	1	1	2	0	0	0	0	1	2	
90	2	18	12	8	3	2	1	1	6		0	4	8	8	4	3	3
91	1	20	12	4	3	2	2	2	0	1	0	4	2	6	3	2	2
92	1	10	4	1	4	1	2	2	0	2	0	0	0	0	3	1	2

(continued on next page)

TABLE 1 (continued)

Number	Sex	Age	Grade	Diagnosis	Section	Retrolental Fibroplasia/No	Visual Acuity	Additional Handicap	Type of Additional Handicap	Guidance Referral	Number of Referrals	Type of Referrals	Referral Disposition	Intelligence Quotients	Conduct	Effort
93	2	11	2	5	1	2	1	2	0	1	0	5	7	4	1	3	3
94	2	08	3	1	4	1	1	2	0	2	0	0	0	0	3	3	2
95	1	16	9	5	4	2	1	1	5		0	6	4	4	4	3	2
96	2	09	4	1	3	1	2	2	0	1	0	1	1	2	3	2	2
97	2	20	13	1	3	1	2	2	0	1	0	2	9	2	3	2	2
98	1	16	9	5	3	2	1	2	0		0	4	9	6	2	2	2
99	1	11	2	1	1	1	2	2	0	2	0	0	0	0	3	2	1
100	2	14	9	7	4	2	2	2	0	2	0	0	0	0	6	2	2
101	1	16	7	1	1	1	2	1	7	1	0	1	7	1	2	2	3
102	2	09	3	8	3	2	2	2	0	2	0	0	0	0	2	1	
103	1	18	7	8	1	2	2	2	0	2	0	0	0	0	2		
104	1	12	5	1	4	1	2	2	0	2	0	0	0	0	3	3	1
105	2	15	10	8	4	2	2	2	0	2	0	0	0	0	6	3	3
106	1	16	9	5	4	2	1	2	0	2	0	0	0	0	4	2	2
107	1	08	3	1	4	1	2	2	0	2	0	0	0	0	3	3	2
108	1	12	5	4	3	2	2	2	0	2	0	0	0	0	3	3	2
109	2	10	5	1	4	1	2	2	0	2	0	0	0	0	3	3	3
110	1	09	3	1	4	1	2	2	0	2	0	0	0	0	3	2	1
111	1	15	8	4	3	2	1	2	0	2	0	0	0	0	2	2	1
112	1	10	5	1	4	1	2	2	0	2	0	0	0	0	3	2	2
113	2	13	6	1	2	1	2	2	0	2	0	0	0	0	0	2	3
114	2	18	9	2	3	2	1	2	0	2	0	0	0	0	2		
115	1	11	5	1	3	1	1	2	0	2	0	0	0	0	2	2	2
116	1	11	5	1	3	1	1	2	0	2	0	0	0	0	2	3	2
117	2	16	12	7	4	2	2	2	0	2	0	0	0	0	4	3	3
118	1	14	7	1	4	1	2	2	0	1	0	3	5	7	4	3	2
119	2	11	6	1	4	1	2	2	0	2	0	0	0	0	5	2	2
120	1	15	9	3	4	2	1	2	0	2	0	0	0	0	3	2	2
121	1	17	12	4	4	2	2	2	0	2	0	0	0	0	5	3	3
122	2	09	3	1	4	1	2	2	0	2	0	0	0	0	5	3	3
123	1	10	3	8	3	2	1	2	0	2	0	0	0	0	1	2	3
124	1	15	10	8	4	2	2	2	0	1	0	6	5	1	5	1	2

(continued on next page)

TABLE 1 (continued)

Number	Sex	Age	Grade	Diagnosis	Section	Retrolental Fibroplasia/No	Visual Acuity	Additional Handicap	Type of Additional Handicap	Guidance Referral	Number of Referrals	Type of Referrals	Referral Disposition	Intelligence Quotients	Conduct	Effort
125	1	11	5	8	4	2	2	2	0	2	0	0	0	0	5	2	2
126	1	13	5	6	4	2	1	2	0	2	0	0	0	0	2	3	2
127	2	11	6	1	3	1	2	2	0	2	0	0	0	0	4	3	3
128	2	15	8	8	3	2	1	2	0	2	0	0	0	0	3	2	2
129	2	09	3	1	4	1	1	2	0	2	0	2	2	2	3	2	2
130	2	13	7	1	4	1	1	2	0	1	0	1	7	8	3	3	2
131	2	09	3	1	4	1	2	2	0	2	0	0	0	0	5	2	2
132	2	08	3	3	4	2	2	2	0	2	0	0	0	0	6	2	3
133	1	14	8	4	4	2	2	2	0	2	0	0	0	0	4	2	2
134	2	15	9	8	4	2	2	2	0	2	0	0	0	0	4	2	2
135	2	16	9	8	3	2	1	2	0	2	0	0	0	0	2		
136	1	12	6	1	4	1	2	2	0	2	0	0	0	0	4	2	2
137	1	16	9	5	3	2	1	2	0	1	0	3	3	9	3	2	2
138	2	17	12	4	3	2	2	2	0	2	0	0	0	0	3	3	2
139	2	13	8	1	4	1	2	2	0	1	0	5	5	6	4	2	1
140	1	12	7	1	3	1	2	2	0	1	0	2	9	2	3	1	1
141	1	13	7	8	4	2	1	2	0	2	0	0	0	0	6	3	2
142	2	16	12	1	4	1	2	2	0	1	0	1	8	6	4	3	1
143	2	16	12	3	3	2	1	2	0	2	0	0	0	0	4		
144	1	11	3	8	3	2	1	1	2	2	0	0	0	0	1	1	1
145	1	11	5	1	4	1	2	2	0	2	0	0	0	0	5	2	1
146	2	10	4	1	4	1	2	2	0	2	0	0	0	0	3	3	3
147	2	14	7	1	1	1	2	2	0	2	0	0	0	0	2	2	2
148	1	09	4	1	4	1	2	2	0	2	0	0	0	0	6	2	2
149	2	09	4	1	4	1	2	2	0	2	0	0	0	0	6	2	2
150	2	11	6	4	4	2	2	2	0	1	0	6	5	3	4	3	3
151	2	11	2	4	1	2	2	2	0	2	0	0	0	0	0	2	2
152	1	15	10	4	4	2	2	2	0	2	0	0	0	0	5	3	3
153	1	15	10	8	4	2	2	2	0	2	0	2	2	2	6	2	2
154	2	19	12	2	3	2	1	2	0	2	0	0	0	0	3		
155	1	09	4	1	3	1	2	2	0	1	0	3	9	7	3	2	2
156	1	15	10	8	4	2	1	2	0	2	0	0	0	0	3		
157	1	13	6	4	2	2	1	2	0	1	0	3	3	2	2	2	3
158	1	12	6	3	4	2	1	2	0	1	0	1	3	9	6	3	3

(concluded on next page)

TABLE 1 (concluded)

Number	Sex	Age	Grade	Diagnosis	Section	Retrolental Fibroplasia/No	Visual Acuity	Additional Handicap	Type of Additional Handicap	Guidance Referral	Number of Referrals	Type of Referrals	Referral Disposition	Intelligence Quotients	Conduct	Effort
159	1	16	10	3	3	2	1	2	0	1	0	2	9	6	4	3	3
160	1	15	7	3	1	2	1	2	0	1	0	3	9	8	1	2	2
161	2	14	8	8	3	2	1	2	0	2	0	0	0	0	3	2	2
162	1	10	4	8	3	2	2	2	0	2	0	0	0	0	3	3	3
163	1	11	5	1	3	1	2	2	0	2	0	0	0	0	3	3	2
164	2	13	2	1	1	1	2	1	1	1	0	1	6	1	0	2	2
165	1	12	4	1	4	1	2	2	0	2	0	0	0	0	3	1	3
166	1	18	12	6	4	2	2	2	0	1	0	2	5	1	3	3	3
167	1	12	6	7	2	2	2	2	0	2	0	0	0	0	3	2	3
168	2	14	7	2	1	2	2	1	2	1	0	4	9	6	1	2	1

*See Figure 2, Coding Sheet for Data Collection, (page 184).

Retrolental Fibroplasic Group. The Retrolental Fibroplasic Group consisted of seventy-nine subjects, thirty-eight of whom were males. Chronological age for the group ranged from eight through twenty years, and subjects were represented in each school grade from the third to the thirteenth. These characteristics of the group were presented in Tables II through IV. As Table V indicated, thirty-seven subjects were in A Sections, thirty-one in B, five in C, and Special Class had an additional five subjects.

Additional handicaps were found in nine subjects in the Retrolental Fibroplasic Group. Of those nine, three were cerebral palsied, three speech handicapped, one epileptic, and the remainder combined cerebral palsy and speech involvement. Tables VI, VII, and VIII indicated the distribution of additional handicaps as well as types of additional handicaps for the retrolental fibroplasic group.

Table IX showed the distribution of intelligence of the Retrolental Fibroplasic Group. Thirty-seven individuals tested in the Average range, while the Very Superior, Borderline, and Mentally Defective categories each contained four subjects. The intelligence categories, Superior, Bright-Normal, and Dull-Normal contained seven, fifteen and eight subjects respectively.

The number of guidance referrals, the type of such referrals, and further, their disposition was indicated in Tables X through XII. Thirteen members of the Retrolental

TABLE II

CHRONOLOGICAL AGE DISTRIBUTION OF THE 166 SUBJECTS

IN THE SUBGROUPS OF THE POPULATION

Subgroups	Chronological Age															Subgroup* Totals
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	25	
Visual Response	1	2	6	7	2	10	5	12	10	1	2	1	2			61
+Special Classes			1	4	1	2	4	2	1		1					16
Multiply Handicapped			3	3		7	5		3		1		1		1	24
Superior Intelligence	1	5		5	1	2	3	4	1	2	1		1			26
+Intensive Grade Range		6	13	18	13	22	21	9	3		1					106
Retrolental Fibroplasia	2	10	11	13	10	14	7	4	4	2	1		1			79
Composite	2	2	6	10	4	9	14	15	11	3	5	1	3	1	1	87
Grand Total Population	4	12	17	23	14	23	21	19	15	5	6	1	4	1	1	166

+Including Seventh Ungraded

*Individuals have multiple subgroup membership

Fibroplasic Group had had twenty-six referrals of varying types, which were disposed of in five different fashions.

As was indicated in Tables XIII and XIV conduct and effort for the group was predominantly Good. While forty-three retrolental fibroplasic subjects had Excellent Conduct and Effort, eighty-six were Good in both regards, while twenty-five were Fair in both categories, and two were Poor.

Table XV showed that ability to respond to visual stimulation was present in eleven cases, whereas the remainder were totally blind.

Composite Group. The Composite or non-retrolental fibroplasic Group contained eighty-nine subjects. However, subjects number four and twenty-eight were not included in the intensive analysis of data owing to the fact that their records were grossly incomplete. The remainder of the Composite Group contained fifty-five males and thirty-two females who were spread through all the grades excepting the Eleventh and were represented in each of the four sections. These subjects were found in each of the age categories of the chronological range. Such information was schematically presented in Tables II through V. In addition, the diagnostic categories of optical pathology were noted in Table VI.

TABLE III

SEX DIVISION OF THE 166 SUBJECTS IN

THE SUBGROUPS OF THE POPULATION

Subgroups	Sex		
	Male	Female	Totals*
Visual Response	35	26	61
+Special Classes	8	8	16
Multiply Handicapped	15	9	24
Superior Intelligence	16	10	26
+Intensive Grade Range	65	41	106
Retrolental Fibroplasia	38	41	79
Composite	55	32	87
Grand Total Population	93	73	166*

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

Fifteen members of the Composite Group had additional handicaps, as was shown in Table VII; Table VIII noted the distribution of such handicaps.

As regarded intelligence, this group was distributed throughout the various categories in the range. Ten subjects had Very Superior intelligence, while five were Superior, thirteen Bright-Normal, and twenty-nine Average. Of those below the average range of intelligence, eighteen were Dull-Normal, nine Borderline, and three Mentally Defective. The distribution of intelligence for the group was presented in Table IX.

Thirty-five subjects in the composite population received one hundred and thirteen referrals to the Guidance Committee. Such referrals were for all of the nine categories of possibility and were disposed of in eight different ways. Tables X through XII presented types of guidance referrals and disposition of such referrals for this population.

Seventy-two of the subjects had Good Conduct and Good Effort as was shown in Tables XIII and XIV. The remaining subjects were distributed among the other categories of Conduct and Effort.

The wide chronological age range which was noted in Table II called for additional explanation. The extreme upper limit of the range resulted, in part, from the fact that several of the subjects had become visually involved in their early youth and had entered the Perkins School for educational re-adaptation at a time when they ordinarily would have

TABLE IV

GRADE DISTRIBUTION OF THE 166 SUBJECTS IN

THE SUBGROUPS OF THE POPULATION

Subgroups	Grade Distribution												Totals*
	3	4	5	6	7	8	9	10	11	12	13	+Special	
Visual Response	6	5	4	6	7	9	11	2		4	2	5	61
+Special Classes												16	16
Multiply Handicapped	1	2	1	5	2	1	2			1	2	7	24
Superior Intelligence	3	3	2	4	2	3		5		2	2		26
+Intensive Grade Range		19	18	24	17	19						9	106
Retrolental Fibroplasia	7	14	13	15	10	9		1		3	2	5	79
Composite	7	5	5	9	7	10	13	6		10	4	11	87
Grand Total Population	14	19	18	24	17	19	13	7		13	6	16	166*

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

been finishing their secondary school programs in the regular schools. Others of those at the upper limit of the range were students from foreign countries who had completed educational programs at home and had matriculated at Perkins for additional academic preparation.

Superior Intelligence Group. The Superior Intelligence Group was made up of subjects from the total population whose scores on the intelligence tests were one hundred and twenty intelligence quotient points or above. The twenty-six subjects in this group -- sixteen of whom were males -- were chronologically aged eight through twenty. Further, the subjects were distributed throughout the grades with the exception of the Ninth and the Eleventh Grades, and were, in addition, represented in only the A and B sections of grades. Such information for the Superior Intelligence Group was presented in Tables II through V. Table VI indicated the distribution of pathology diagnosis for the group, and Table VII noted the fact that no members of the group had multiple handicaps.

Four of the subjects in the Superior Intelligence Group had a total of ten guidance referrals. Such referrals were for Scholastic, Physical, or the combination Family-Behavior, and were disposed of in four different fashions by the Guidance Committee of the school. Tables X through XII presented all information on guidance referrals for the group.

TABLE V

SECTION DISTRIBUTION OF THE 166 SUBJECTS IN

THE SUBGROUPS OF THE POPULATION

Subgroups	A Section	B Section	C Section	Special	Totals*
Visual Response	19	33	4	5	61
+Special Classes				16	16
Multiply Handicapped	4	11	2	7	24
Superior Intelligence	24	2			26
+Intensive Grade Range	44	44	9	9	106
Retrolental Fibroplasia	38	31	5	5	79
Composite	32	40	4	11	87
Grand Total Population	70	71	9	16	166

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

Conduct for the Superior Intelligence Group was diverse as noted in Table XIII. Table XIV noted a similar diversity with regard to Effort.

The number of those in the group responding to visual stimulation was presented in Table XV. It was seen that five subjects in the Superior Intelligence Group were responsive to visual sensation.

Special Class or its equivalent group. As Table IV indicated, sixteen subjects were assigned to Special Classes. One of the classes was specifically designated as a Special Class, and contained four of the males and three of the females in the total Special Class Group. The second class was developed as an Ungraded Section of the Seventh Grade, with the specific title of Seventh Ungraded. This class had a population of nine, five of whom were females. It appeared reasonable to refer to the Ungraded Class as a Special Class, owing to the fact that various of its members had been in the Special Class in the primary grades, or were treated as special students in the lowest section of the grade to which they had previously been assigned. In addition, the program of the Ungraded Class was not of an academic nature, per se. In effect, the Special Class in the elementary school was a Primary Special Class, while the Ungraded Class was an Intermediate Special Class.

The age range for the eight females and eight males in this group was, as Table II indicated, eight years. A group

TABLE VI

DIAGNOSTIC DISTRIBUTION OF THE 166 SUBJECTS IN

THE SUBGROUPS OF THE POPULATION

Subgroups	Retro-lental Fibro-plasia	Catar-acts	Retin-itis Pigmen-tosa	Buphthal-mus Glau-coma	Optic Atrophy	Ambly-opia	Retino-blas-toma	Other	Totals*
Visual Response	11	10	7	7	7	4		15	61
+Special Classes	5	3	1	3	1	2		1	16
Multiply Handicapped	9	3		1	5	2		4	24
Superior Intelligence	11	1	2	3		1	3	5	26
+Intensive Grade Range	64	8	2	12	4	2	4	10	106
Retrolental Fibroplasia	79								79
Composite		13	8	19	9	6	5	27	87
Grand Total Population	79	13	8	19	9	6	5	27	166*

+Including Seventh Ungraded

* Individuals have multiple subgroup membership

of four subjects was eleven years of age, while an additional group of four subjects was fourteen years of age at the time of this study. In addition, there were three groups of two each of the ages twelve, thirteen, and fifteen. The remaining two subjects in the Special Class Group were sixteen and eighteen years of age respectively.

Five of the subjects were visually affected through retrolental fibroplasia, while the remaining eleven were grouped under varying diagnostic categories. In addition, it was found that seven members of the Special Class Group had additional handicaps. Information pertaining to diagnostic categories, additional handicaps, and type of additional handicaps was noted in Tables VI through IX.

As was to be expected in a group of this nature, intelligence was predominantly below average. Four members of the group tested within the Mentally Defective category, seven had Borderline classification, four were Dull-Normal, and one subject tested in the Average range of intelligence. Table IX showed the distribution among the various categories of intelligence for this group.

All but four members of the Special Class Group were referred to the Guidance Committee on one or more occasions. The twelve subjects who were referred appeared on committee agenda a total of thirty-nine times. Types of referral, as well as disposition of referrals, for the Special Class Group were presented in Tables XI and XII. Conduct and Effort for

TABLE VII

DISTRIBUTION OF MULTIPLE HANDICAPS AMONG THE 166

SUBJECTS IN THE SUBGROUPS OF THE POPULATION

Subgroups	Additional Handicaps		Totals*
	Yes	No	
Visual Response	11	50	61
+Special Classes	7	9	16
Multiply Handicapped	24		24
Superior Intelligence		26	26
+Intensive Grade Range	16	90	106
Retrolental Fibroplasia	9	70	79
Composite	15	72	87
Grand Total Population	24	142	166

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

the group was shown in Tables XIII and XIV. It was noted that Conduct was classified as Fair for thirteen subjects, and Good for two, and one subject was not evaluated. Effort for the group showed a greater distribution, with Excellent Effort being noted in two cases, Good in eight, Fair in five, and two subjects were classified as having made Poor Effort.

Five members of the group responded to visual stimulation, as was seen in Table XV.

Multiply Handicapped Group. Twenty-four subjects within the total population of the study had additional handicaps in conjunction with visual involvement. These subjects were grouped and their performance analyzed in terms of the study's aims to determine if they displayed unique characteristics.

As Table III showed, the group consisted of fifteen males and nine females. The chronological age range for the group was fifteen years. Table II displayed the distribution within the chronological age range.

Subjects with multiple handicaps were represented in all but two grades, as Table IV indicated, Sectional distribution for the multiply handicapped consisted of four in A Sections, eleven in B, two in C, and seven in Special Class or its equivalent. Table V noted such information.

Of the twenty-four subjects in this group, nine were visually involved as a result of retrolental fibroplasia, three owing to cataracts, one as a result of buphthalmus/

TABLE VIII

DISTRIBUTION OF TYPES OF MULTIPLE HANDICAPS

IN THE SUBGROUPS OF THE POPULATION

Subgroups	Types of Additional Handicaps						Totals*
	Cerebral Palsy	Epilepsy	Hearing	Arthritis	Speech	Cerebral Palsy Speech	
Visual Response	3	1	2	1	3	1	11
+Special Classes	1	1	1		2	2	7
Multiply Handicapped	5	2	2	1	10	4	24
Superior Intelligence	0	0	0	0	0	0	0
+Intensive Grade Range	4	2			6	4	16
Retrolental Fibroplasia	3	1			3	2	9
Composite	2	1	2	1	7	2	15
Grand Total Population	5	2	2	1	10	4	24

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

TABLE IX

DISTRIBUTION OF INTELLIGENCE AMONG THE 166 SUBJECTS

IN THE SUBGROUPS OF THE POPULATION

Subgroups	Intelligence							Totals*
	Very Superior	Superior	Bright Normal	Average	Dull Normal	Border-line	Mental Defective	
Visual Response	4	1	7	25	17	7		61
+Special Classes				1	4	7	4	16
Multiply Handicapped			4	6	6	7	1	24
Superior Intelligence	14	12						26
+Intensive Grade Range	9	5	18	43	19	9	3	106
Retrolental Fibroplasia	4	7	15	37	8	4	4	79
Composite	10	5	13	29	18	9	3	87
Grand Total Population	14	12	28	66	26	13	7	166

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

glaucoma, five optic atrophy, two amblyopia, and four subjects were in the other category of diagnosis. In this group, ten subjects were speech handicapped, two epileptic, two auditory impairment, one arthritic, five cerebral palsy, and four subjects were cerebral palsied and speech handicapped. Information regarding diagnostic categories as well as distribution and types of multiple handicaps was presented in Tables VI and VIII.

Table IX showed that the multiply handicapped were predominantly below average in intelligence. Fourteen subjects were either Dull-Normal, Borderline, or Mentally Defective, while the remaining ten in the group were Average or Bright Normal in tested intelligence.

Guidance information for the Multiply Handicapped Group was presented in Tables X through XII. It was noted that sixteen subjects in this group had forty referrals. Such referrals were of eight different types, and were disposed of by the Guidance Committee in six different fashions.

The distribution of Conduct and Effort for this group was noted in Tables XIII and XIV. Such distributions contained information on twenty-one of the twenty-four subjects in the multiply handicapped population.

Visual Response Group. Those subjects within the total population of the study who responded to visual stimulation were treated as a sub-group. It was not meant to infer that such visual response connoted that vision was of functional

TABLE X

NUMBER OF GUIDANCE REFERRALS AMONG THE 166 SUBJECTS

IN THE SUBGROUPS OF THE POPULATION

Subgroups	Number of Guidance Referrals									Totals*
	1	2	3	4	5	6	7	8	9	
Visual Response	7	5	6	2	1	2	1			67
+Special Classes	3	3	2	1	2	1				35
Multiply Handicapped	4	4	3	2		2				41
Superior Intelligence	2	1				1				10
+Intensive Grade Range	16	11	8	1	2	1	1			89
Retrolental Fibroplasia	15	5	4	2						45
Composite	7	9	7	4	3	4	1			108
Grand Total Population	22	14	11	6	3	4	1		153	

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

value to all the subjects in the sub-group. However, it was felt that the ability to react to stimulation of a visual nature might have some particular effect on the individual which could be demonstrated within the framework of this study.

It should also be mentioned that it was not possible to determine the true level of visual acuity shown by those responding to that sensory stimulation. The method of acknowledging visual response by subjects was not uniform throughout the ophthalmological reports available to the writer, nor was the degree of response noted in any manner which could be qualified or treated in other discreet manners. For those reasons, the writer used the gross method of response or lack of response with the hope that any unique patterns which might be observed in the Visual Response Group would suggest some basis for further, more intensive analysis.

The thirty-five males and twenty-six females in the Visual Response Group varied in age from eight to twenty. In addition, members of this group were in all of the grades in the study range excepting the Eleventh, and were in all of the grade sections. Such information was shown in Tables II through IV.

As Table VI indicated, eleven of the subjects in the group were visually handicapped as a result of retrolental fibroplasia. The remaining fifty subjects were dispersed among the other diagnostic categories, excepting that of Retinoblastoma. Further, eleven members of the group had

TABLE XI

TYPES OF GUIDANCE REFERRALS AMONG SUBJECTS

IN THE SUBGROUPS OF THE POPULATION

Subgroups	Types of Guidance Referrals									Totals*
	Family	Behavior	Scholastic	Physical	Family Behavior	Family Scholastic	Scholastic Physical	Behavior Physical	Behavior Scholastic	
Visual Response	1	5	4	2	2	1	2	2	5	24
+Special Classes		2	1	1	1	1	2		4	12
Multiply Handicapped	1	1	1	4			2	1	5	15
Superior Intelligence			1	11	2					4
+Intensive Grade Range	5	7	4	3	8	1	3		9	40
Retrolental Fibroplasia	5	3	2	1	5	2	2	1	5	26
Composite		7	5	4	8		2	2	7	35
Grand Total Population	5	10	7	5	13	2	4	3	12	61

+Including Seventh Ungraded *Individuals have multiple subgroup membership

multiple handicaps, of which three were speech, one epilepsy, two hearing impairment, one arthritis, three cerebral palsy, and one the combination cerebral palsy and speech handicap. It was also seen that the sixty-one members of the Visual Response Group were distributed throughout the range of the intelligence categories, exclusive of Mentally Defective. Twenty-five subjects were Average in intelligence, while seventeen were Dull-Normal; two groups of seven each were Borderline or Bright-Normal, and the remaining five subjects were Superior or Very Superior in intelligence. The distribution of diagnosis, of optic pathology as well as of multiple handicaps, types of multiple handicaps, and intelligence for the Visual Response Group were noted in Tables VI through IX.

As Table X indicated, twenty-four subjects in the group had referrals to the Guidance Committee. Such referrals varied throughout the range of possible types of referrals as shown in Table XI. Dispositions of guidance referrals for the Visual Response Group were similarly dispersed among the categories of possible Guidance Committee action. The single exception was that no visual response subject had his referral disposed of by means of Discipline. Table XII was concerned with the disposition of referrals.

In both Conduct and Effort, the majority of subjects were rated as Good. Seventeen subjects had Excellent Conduct, while six were Fair, and one was Poor. Data were missing with regard to Conduct and Effort for ten members of the group.

TABLE XII

DISPOSITION OF REFERRALS AMONG SUBJECTS

IN THE SUBGROUPS OF THE POPULATION

Subgroups	Disposition of Guidance Referrals								
	Guidance Counseling	Environmental Manipulation	Psychological Treatment	Medical Treatment	Guidance and Counseling/ Environmental Manipulation	Environmental/ Psychological	Medical Discipline	No Program Necessary	Totals*
Visual Response	1	9		3	5	1	3	2	24
+Special Classes	2	4	1	2	2		1		12
Multiply Handicapped	2	6	1	3	2		1		15
Superior Intelligence	1		1	1				1	4
+Intensive Grade Range	3	18	3	2	6	4	2	2	40
Retrolental Fibroplasia	4	11	1		4	4	1	1	26
Composite	4	10	3	6	6	1	2	3	35
Grand Total Population	8	21	4	6	10	5	3	4	61

+Including Seventh Ungraded * Individuals have multiple subgroup membership

Tables XIII and XIV showed the spread of the Visual Response Group among the varying categories of gradations of Conduct and Effort.

Intensive Grade Range Group. The population of this study was distributed throughout eleven grades, a Special Class, and an Ungraded Section. It was felt that such a wide grade range would more meaningfully indicate the relative academic and social achievement of the various diagnostic groupings, when related to their grade peers. However, the writer found that various of the diagnostic groups were disproportionately represented in certain grades. For example, the great mass of retrolental fibroplasic students was found in grades Three through Eight, with only occasional representation in the higher grades. Further, as the time range for this study was up to a four year period, it was thought that the achievement test scores which were obtained for only a single year -- as in the Third Grade, 1957 -- would be less representative of actual competence than scores obtained for a two-year period or more.

In considering all the aforementioned points, it was thought reasonable and proper to direct the focus of the study towards the grade range in which the retrolental fibroplasic population had sufficient numbers for statistical meaning, in which there were representatives from the other diagnostic categories and, further, where achievement test scores were obtainable for at least a two-year period. In line with that

TABLE XIII

CONDUCT OF THE 166 SUBJECTS IN THE

SUBGROUPS OF THE POPULATION

Subgroups	Conduct					Totals*
	Excellent	Good	Fair	Poor	Missing Data	
Visual Response	17	27	6	1	10	61
+Special Classes	2	13			1	16
Multiply Handicapped	4	14	2		4	24
Superior Intelligence	9	13	2		2	26
+Intensive Grade Range	27	64	12	2	1	106
Retrolental Fibroplasia	24	46	7	1	1	79
Composite	25	37	10	1	14	87
Grand Total Population	49	83	17	2	15	166

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

reasoning, the Fourth through Eighth Grades were singled out as a discreet entity and, for the purposes of this study, designated as the Intensive Grade Range Group. The sixty-five males and forty-one females in those five grades were treated as a unit and, in addition, the several grades were considered individually with appropriate weight given to diagnostic groupings when such an auxiliary procedure seemed warranted.

The chronological age of subjects in the Intensive Grade Range Group varied from nine to eighteen years, as Table II showed. Subjects in this group were distributed through the five grade range as follows: Nineteen in the Fourth Grade, eighteen in the Fifth Grade, twenty-four in the Sixth Grade, twenty-six in the Seventh Grade when the Ungraded Section was included, and nineteen in the Eighth Grade. Further, forty-four subjects were assigned to the A Sections of their grade, forty-four to B Sections, nine to C, and an additional nine were in the Special Section, or Seventh Ungraded. Information on grade and section distribution was shown in Tables IVI and IV.

The subjects in the Intensive Grade Range Group were found in all of the various diagnostic categories of optical pathology. Sixty-four subjects were visually involved as a result of retrolental fibroplasia, eight owing to cataracts, two as a result of retinitis pigmentosa, twelve buphthalmus/glaucoma, four optic atrophy, two amblyopia, four retino-

TABLE XIV

EFFORT AMONG THE 166 SUBJECTS IN THE

SUBGROUPS OF THE POPULATION

Subgroups	Effort					Totals*
	Excellent	Good	Fair	Poor	Missing Data	
Visual Response	15	27	7	2	10	61
+Special Class	2	8	5		1	16
Multiply Handicapped	5	11	3		5	24
Superior Intelligence	9	14	1		2	26
+Intensive Grade Range	26	56	21	2	1	106
Retrolental Fibroplasia	19	40	18	1	1	79
Composite	26	36	9	2	14	87
Grand Total Population	45	76	27	3	15	166

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

TABLE XV

VISUAL RESPONSE AMONG THE 166 SUBJECTS IN

THE SUBGROUPS OF THE POPULATION

Subgroups	Visual Response		Totals*
	Yes	No	
Visual Response	61		61
+Special Classes	5	11	16
Multiply Handicapped	11	13	24
Superior Intelligence	5	21	26
+Intensive Grade Range	34	72	106
Retrolental Fibroplasia	11	68	79
Composite	50	37	87
Grand Total Population	61	105	166

+Including Seventh Ungraded
*Individuals have multiple subgroup membership

blastoma, and the remaining ten subjects were in the category of "other". Information pertaining to diagnostic categories was noted in Table VI.

Of the sixteen subjects in the Intensive Grade Range Group having multiple handicaps, Table VIII showed that four were cerebral palsied, six speech handicapped, two epileptic, and four combined cerebral palsy and speech handicap. It was further noted that the intelligence distribution for the group was as follows: three subjects Mentally Defective, nine subjects Borderline, nineteen subjects Dull-Normal, forty-three subjects Average, eighteen subjects Bright-Normal, five subjects Superior, and nine subjects Very Superior in tested intelligence. Such a distribution was shown in Table IX.

Tables X through XIV showed the Intensive Grade Range Group in relation to other subgroups of the study population in such areas as guidance referrals and types and dispositions of such referrals, as well as Conduct and Effort. It was seen that forty subjects in the group had guidance referrals, and it was also noted that twenty-seven of the subjects had Excellent Conduct, sixty-four Good Conduct, twelve Fair, and two Poor Conduct. Effort for the Intensive Grade Range Group was also dispersed among the four categories of evaluation. Thirty-four of the subjects responded to visual stimulation as noted in Table XV.

Diagnostic Groups. In an effort to understand how the

various diagnostic groups of ocular pathology affect the over-all intellectual and academic level of a heterogeneous blind population, the subjects in this study were divided into eight diagnostic categories. Such groupings, it was felt, would, after analysis, indicate whether different diagnostic categories had unusual or peculiar patterns of tested intelligence or demonstrated academic and social achievement.

As Table XVI indicated, the population was distributed among eight different diagnostic categories, and the subjects ranged in chronological age from eight to twenty-five years. The distribution of sexes among the diagnostic categories was indicated in Table XVII and showed that there was a total of ninety-three males and seventy-three females in the entire population of the study. In addition, Table XVIII indicated the grade distribution for the Diagnostic Groups, and noted that retrolental fibroplasia occurred with greater frequency between the third and eighth grades than in any other grade range. The table also showed that retrolental fibroplasia was the largest diagnostic categories among all the varying categories of pathology. Further, Table XIX exhibited the distribution of section placement for the categories, and showed that at the time the data were collected, seventy subjects were in A Section, seventy-one in B, nine in C, and sisteen subjects were in Special Class or the Ungraded Section of the Seventh Grade.

The status of multiple handicaps, as it pertained to the

TABLE XVI

CHRONOLOGICAL AGE DISTRIBUTION IN THE

DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Chronological Age															Numbers
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	25	
Retrolental Fibroplasia	2	10	11	13	10	14	7	4	4	2	1		1			79
Cataracts		1	1			1	4	2	1		1	1	1			13
Retinitis Pigmentosa	1				1			3	2	1						8
Buphthalmos/ Glaucoma				5	2	3	3	3		2			1			19
Optic Atrophy			1	1		2	1		4							9
Amblyopia			1			1	1				2		1			6
Retinoblastoma					1		3		1							5
Other	1	1	3	4		2	2	7	3		2			1	1	27
Grand Total Population	4	12	17	23	14	23	21	19	15	5	6	1	4	1	1	166

presence or absence of such handicaps, was shown in Table XX. It was noted that two diagnostic categories were without additionally handicapped subjects. Table XXI indicated the types of additional handicaps.

Tested intelligence for the various diagnostic groups was shown in distribution form in Table XXII. Average intelligence was the most common placement for subjects in all of the various diagnostic groups excepting two.

Of the one hundred and sixty-two subjects in the various diagnostic categories, sixty-one were responsive to visual stimulation. It was also noted, Table XXIII, that in five of the eight categories, there were more subjects responding to visual stimulation than those without such responses.

Types of guidance referrals, as well as their dispositions, were shown in Tables XXIV and XXV.

It was noted in the former table that referrals to the Guidance Committee for reasons of family/behavior and behavior/scholastic predominated among those having guidance referrals.

Conduct and Effort for the diagnostic groups were shown in Tables XXVI and XXVII. Such data were available for one hundred and fifty-one of the one hundred and sixty-six subjects in the study's population.

TABLE XVII

SEX DIVISION IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Sex		Numbers
	Male	Female	
Retrolental Fibroplasia	38	41	79
Cataracts	5	8	13
Retinitis Pigmentosa	5	3	8
Buphthalmos/Glaucoma	14	5	19
Optic Atrophy	8	1	9
Amblyopia	6		6
Retinoblastoma	3	2	5
Other	14	13	27
Grand Total Population	93	73	166

TABLE XVIII

GRADE DISTRIBUTION IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Grade Distribution												Numbers
	3	4	5	6	7	8	9	10	11	12	13	Special*	
Retrolental Fibroplasia	7	14	13	15	10	9		1		3	2	5	79
Cataracts	1	1			3	1	2			1	1	3	13
Retinitis Pigmentosa	1			1			2	1		2		1	8
Buphthalmos/ Glaucoma			2	6	2	2		1		3		3	19
Optic Atrophy		1	1	1	1		4					1	9
Amblyopia			1							2	1	2	6
Retino-blastoma				1		3				1			5
Other	5	3	1		1	4	5	4		1	2	1	27
Grand Total Population	14	19	18	24	17	19	13	7		13	6	16	166

*Including Seventh Ungraded

TABLE XIX

SECTION DISTRIBUTION IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Section				Numbers
	A	B	C	Special	
Retrolental Fibroplasia	38	31	5	5	79
Cataracts	4	6		3	13
Retinitis Pigmentosa	5	2		1	8
Buphthalmos/Glaucoma	5	8	3	3	19
Optic Atrophy	3	5		1	9
Amblyopia	3	1		2	6
Retinablastoma	4		1		5
Other	8	18		1	27
Grand Total Population	70	71	9	16	166

TABLE XX

STATUS OF MULTIPLE HANDICAPS IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Additional Handicaps		Numbers
	Yes	No	
Retrolental Fibroplasia	9	70	79
Cataracts	3	10	13
Retinitis Pigmentosa		8	8
Buphthalmos/Glaucoma	1	18	19
Optic Atrophy	5	4	9
Amblyopia	2	4	6
Retinoblastoma		5	5
Other	4	23	27
Grand Total Population	24	142	166

TABLE XXI

TYPES OF ADDITIONAL HANDICAPS IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Types of Additional Handicaps						Numbers
	Cerebral Palsy	Speech	Epilepsy	Hearing	Arthritis	Cerebral Palsy/ Speech	
Retrolental Fibroplasia	3	3	1			2	9
Cataracts		3					3
Retinitis Pigmentosa							
Buphthalmos/ Glaucoma						1	1
Optic Atrophy	2	1		1		1	5
Amblyopia			1	1			2
Retino-blastoma							
Other		3			1		4
Grand Total Population	5	10	2	2	1	4	24

TABLE XXII

DISTRIBUTION OF INTELLIGENCE IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Intelligence							Numbers
	Very Superior	Superior	Bright Normal	Average	Dull Normal	Borderline	Mental Defective	
Retrolental Fibroplasia	4	7	15	37	8	4	4	79
Cataracts	1		2	5	2	3		13
Retinitis Pigmentosa	2		2	3		1		8
Buphthalmos/ Glaucoma		3	3	6	4		3	19
Optic Atrophy			2	3	2	2		9
Amblyopia	1			2	2	1		6
Retino-blastoma	3		1	1				5
Other	3	2	3	9	8	2		27
Grand Total Population	14	12	28	66	26	13	7	166

TABLE XXIII

STATUS OF VISUAL RESPONSE IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Sub-groups	Visual Response		Numbers
	Yes	No	
Retrolental Fibroplasia	11	68	79
Cataracts	10	3	13
Retinitis Pigmentosa	7	1	8
Buphthalmos/Glaucoma	7	12	19
Optic Atrophy	8	2	9
Amblyopia	4	2	6
Retinoblastoma		5	5
Other	15	12	27
Grand Total Population	61	105	166

TABLE XXIV

TYPES OF GUIDANCE REFERRALS IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Types of Guidance Referrals									
	Family	Behavior	Scholastic	Physical	Family/ Behavior	Family Scholastic	Scholastic/ Physical	Behavior Physical	Behavior Scholastic	Numbers
Retrolental Fibroplasia	5	3	2	1	5	2	2	1	5	26
Cataracts		3			1				2	6
Retinitis Pigmentosa		1	1						2	4
Buphthalmos/ Glaucoma		2	1	1	2				1	7
Optic Atrophy		1	1	1			2		1	6
Amblyopia			1		2				1	4
Retino-blastoma				1	1					2
Other			1	1	2			2		6
Grand Total Population	5	10	7	5	13	2	4	3	12	61

TABLE XXV

DISPOSITION OF GUIDANCE REFERRALS IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Numbers									
	Guidance Counseling	Environmental Manipulation	Psychological Treatment	Medical	Discipline	Guidance and Counseling/ Environmental Manipulation	Environmental Manipulation Psychological Treatment	Medical Discipline	No Program	
Retrolental Fibroplasia	4	11	1			4	4	1	1	26
Cataracts		3				3				6
Retinitis Pigmentosa	1					1		1	1	4
Buphthalmos-Glaucoma		2	2	2		1				7
Optic Atrophy		2		2		1			1	6
Amblyopia	2	2								4
Retino-blastoma			1	1						2
Other	1	1		1			1	1	1	6
Grand Total Population	8	21	4	6		10	5	3	4	61

TABLE XXVI

CONDUCT IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Conduct					Numbers
	Excellent	Good	Fair	Poor	Missing Data	
Retrolental Fibroplasia	24	46	7	1	1	79
Cataracts	3	4	3		3	13
Retinitis Pigmentosa	3	3			2	8
Buphthalmos/Glaucoma	6	12	1			19
Optic Atrophy	2	6		1		9
Amblyopia	3	2			1	6
Retinoblastoma	1	4				5
Other	7	6	6		8	27
Grand Total Population	49	83	17	2	15	166

TABLE XXVII

EFFORT IN THE DIAGNOSTIC GROUPS OF THE POPULATION

Diagnostic Groups	Excellent	Good	Fair	Poor	Missing Data	Numbers
Retrolental Fibroplasia	19	40	18	1	1	79
Cataracts	3	4	3		3	13
Retinitis Pigmentosa	4	2			2	8
Buphthalmos/Glaucoma	6	10	3			19
Optic Atrophy	1	7		1		9
Amblyopia	2	3			1	6
Retinoblastoma	2	3				5
Other	8	7	3	1	8	27
Grand Total Population	45	76	27	3	15	166

SUMMARY

Chapter III was concerned with the materials and methods used in the study, as well as with the subjects who served as its population. The rationale for the choice of the study population was discussed.

Consideration was given to academic achievement and intelligence tests which were administered to the population as well as to other sources of academic information.

Adaptations necessary for the use of achievement and intelligence tests with non-sighted and partially sighted subjects were surveyed. Mention was made of the various types of ocular and physical pathology which were found in the populations, as well as of the sources of such data. In addition, the types and limitations of social and behavioral information which were used in the study were discussed.

The development and composition of the various subgroups of the population was explored. Such groups consisted of the Retrolental Fibroplasic Group, the Composite Group, Superior Intelligence Group, Special Class or its Equivalent Group, Multiply Handicapped Group, Visual Response Group, Intensive Grade Range Group, and the various diagnostic categories of optical pathology into which the total population of the study was divided. Selected information as to the character of the various subgroups was presented in table form.

CHAPTER IV

STATISTICAL ANALYSIS AND SUBGROUP EXPOSITION

Although data were collected on one hundred and sixty-eight subjects at the Perkins School for the Blind, the bulk of the statistical analysis was concerned with the one hundred and six students who were in the fourth to the eighth grade as of the 1956-1957 school year. This limitation was dictated both by the nature of the study as well as by the availability of sufficient data to make such a study practical. The Third Grade was not included in the intensive analysis because of the fact that achievement testing at that grade level had only been started recently, and there was very little that could be said about the reliability of such data. Beyond the Eighth Grade and including the Ninth through the Thirteenth Grades, there were only six subjects whose visual impairment resulted from retrolental fibroplasia, and of these six, none were in the Ninth Grade. Therefore, in that a primary objective of this study was to determine the academic achievement of retrolental fibroplasies, an intensive analysis was made of the performance of such diagnostic subjects where they had numerical preponderance.

In statistical terms, the principal aim of this study was to test the null hypothesis that there were no differences, other than could be attributed to chance, between a group of subjects blind as a result of retrolental fibro-

plasia, and another group of subjects with diverse diagnoses. The Composite Group was further analyzed by an examination of some of its larger diagnostic categories, in order to make inferences about a generalization at the stated null hypothesis; that for this particular population of blind subjects and in terms of the given measures, there were none other than chance differences between the various diagnostic groups.

The small numbers of subjects in the subgroup of the Composite Group made conclusions with regard to their intellectual and academic characters tentative. However, there appeared to be some justification for attempting to develop conclusions about them. For example, it was suggested in the literature that comparisons between one diagnostic group and another group composed of a variety of diagnoses of visual pathology was not sufficiently sensitive to the character of individual diagnostic categories.[1] In addition, studies by Hayes considered the blind as a homogeneous group.[2] His attempt was to analyze this group *en masse* and to draw conclusions about the intelligence of the blind and the academic achievement of the blind as compared to those respective qual-

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[1]Arthur H. Parmlee, Margery Gilbert Cutsforth and Claire L. Jackson, "Mental Development of Children with Blindness Due to Retrolental Fibroplasia," *American Medical Association Journal of Diseases of Children*, 96:652-653, December, 1958.

[2]Samuel P. Hayes, *First Regional Conference on Mental Measurement of the Blind* (Watertown, Massachusetts: Perkins Publications, 1952), pp. 27-30.

ities in their sighted peers. While the results of such studies indicated that the sighted and nonsighted were comparable, there was nothing done about a further breakdown within the blind group in order to determine whether or not different diagnostic groups were contributing in different ways to the aggregate comparable average.

The question as to whether the various diagnostic groups have particular academic and intellectual characteristics was thought to be educationally important. Since the retrolental fibroplasic group will constitute a large percentage of the total blind school population in the next decade, it was thought important that they be compared with various other diagnostic groups in order to ascertain whether they would necessitate special adaptations in existing educational and ancillary services. This consideration would appear to have been largely overlooked in the context of previous studies.

I. STATISTICAL ANALYSIS

In order to use all available data for all of the subjects in the grade which were analyzed, a model series of analyses of variance was set up from Table XXIX. An "x" indicated that a grade had test results for the trial under which it was recorded. For example, Grade Five was tested for trials Fourth and Fifth, etc. It can be seen from this table that the data were so treated as to get a maximum

number of grades or a maximum number of trials or a combination of the two with the result that the study took on a longitudinal dimension. In order to get a maximum number of measures and because of missing data in several of the trials, the model contained considerable overlapping. Table XXIX indicated the number of students in each of the grades that were used in the models.

The structure of each analysis of variance accompanied the analysis of variance tables which were appended to this study. In this aspect of the study, Grade Four was not included owing to the fact that only one set of scores was available for them. However, since the fourth trial was used in several of the analyses, it was felt that that academic level was accounted for in a rigorous way.

Two types of data were used in these analyses: achievement test scores and grade scores. The first breakdown of groups in these analyses was determined by a dichotomous diagnostic consideration: Retrolental Fibroplasia Group and Composite Group. The second breakdown of groups was determined by a dichotomous visual consideration -- non-visual response and visual response. In order to find out whether visual response and intelligence were interacting, i.e. whether the lack of vision had a different effect on different intelligence levels, the second breakdown was further divided into the various intelligence categories and separate analyses were performed.

TABLE XXVIII

YEARS IN WHICH GRADES WERE TESTED

	Trials				
Grades	Fourth	Fifth	Sixth	Seventh	Eighth
Fifth	x	x			
Sixth	x	x	x		
Seventh	x	x	x	x	
Eighth		x	x	x	x

TABLE XXIX

NUMERICAL REPRESENTATION BY GRADE

Grade	Numbers
Fifth	18
Sixth	24
Seventh	26
Eighth	19

Inferences drawn from the analysis of the Retrolental Fibroplasia Group and Composite Group were colored by the nature of the Composite Group. It might appear that any conclusions to be drawn from an analysis using such dichotomous groups would be limited to statements about how the Retrolental Fibroplasic Group did or did not differ from the Composite Group. However, Table XXXI showed that the various subgroups of the composite subjects were grouped in the several grades in such a way as to suggest that if etiological considerations were affecting test scores, they would appear in one or more of the forty-seven analyses of variance which were performed.

It was seen in Table XXXI that six of the nine Composite Group subjects in Grade Six were buphthalmus-glaucoma, and that there were no cataracts, while in Grade Seven there were six subjects with cataracts and only two with buphthalmus/glaucoma. If the two diagnostic groups showed significant differences in the analysis, then little could be inferred from these figures. However, if no significant differences were found in any of the analyses, then this uneven clustering of diagnostic subgroups was not differentially affecting the relationship between the Retrolental Fibroplasic Group and the Composite Group. It followed that if such were the case, it would appear to give evidence that there was no relationship between etiology and the educational measures that were used.

TABLE XXX

NUMERICAL REPRESENTATION OF DIAGNOSTIC GROUPS

IN THE INTENSIVE GRADE RANGE

Diagnostic Group	Grade Range			
	Fifth	Sixth	Seventh	Eighth
Retrolental Fibroplasia	13	15	13	9
Cataracts			6	1
Retinitis Pigmentosa		1	1	
Buphthalmus/Glaucoma	2	6	2	2
Optic Atrophy	1	1	1	
Amblyopia	1		1	
Retinoblastoma		1		3
Other	1		2	4
Total Population	18	24	26	19

The model series of analyses of variance contained seven models as shown in Table XXXII. A model consisted of a particular combination of grade levels and trials as well as intelligence scores. Grade level referred to a particular grade or grades in the year when the data were collected and trial referred to a year or years in the course of connection with that grade. For example, in Model I the analysis of variance was concerned with the performance of the Fifth and Sixth Grades for a two- and three-year period respectively. That is, the Fifth Grade was considered for its Fourth as well as Fifth Grade performance while the Sixth Grade was considered for its Fourth and Fifth as well as Sixth Grade performance.[3]

The type of performance for which the various models were used were shown in Table XXXIII. Models I through V were used in the analysis of the achievement test results for retrolental fibroplasics versus the composite category. Models III and VI were used in the analysis of grade scores for retrolental fibroplasics versus the Composite Group. Models IV and VIII were used in the analysis of achievement test scores for non-visual response versus visual response subjects. Not all of the models were used for all of the different types of achievement subtests or for all of the academic subjects. However, the forty-seven analyses of variance that were computed were thought to be representative

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[3]See Table XXIX, page 115, for corroboration.

TABLE XXXI

MODEL OF THE SERIES OF ANALYSIS

OF VARIANCE

Model Number	Grades	Trials	Intelligence Scores
I	5,6	4,5	All
II	6,7	4,5,6	All
III	7,8	5,6,7	All
IV	6,7,8	5,6	All
V	8	5,6,7,8	All
VI	5,6,7	4,5	All
VII	All	5	Selected

TABLE XXXII

USE OF ACHIEVEMENT TEST SCORES AND GRADE SCORES IN THE SEVEN MODELS FOR THE ANALYSIS OF VARIANCE

Groups	Type Measurement	Subject Matter							
		Word Meaning	Language	Arithmetic	Science	Reading	Social Studies	Spelling	All
Retrolental Fibroplasic Group **versus** Composite Group	Achievement Test Scores	I II III V	I II III V	I II III V	II III V	I II III IV V	II III V	II III V	
	Academic Grade Scores			III VI	VI	III VI	III VI		
Visual Response **versus** Non-Visual Response Group	Achievement Test Scores	VII	VII	IV VII VII	VII	VII VII	VII VII	VII VII	VII VII

of both areas.

Models I through VI employed a "group times trial" analysis of variance that provided for sensitive tests as to whether the groups involved were different, and as to whether the diagnostic groups displayed different types of growth in achievement test scores or grade scores over the trials. Sources of variation due to trials and subjects were eliminated in the process. It was noted that both trials and subjects show significant values in all of the analyses. That is to say, there were changes from trial to trial, and the subjects were different in their individual performance. Model VII involved simple one-way classification analysis of variance where the only source of variation considered was the difference between the groups.

As was seen from the Tables of Analyses of Variance, the results were, with just one exception, consistent throughout the analyses of variance. The Retrolental Fibroplasic Group versus Composite Group, and the Non-visual Response versus Visual Response Group did not show any differences in their performance in achievement tests or in their school grades. The exception existed in achievement test and grade scores for Arithmetic between the Retrolental Fibroplasic Group and the Composite Group. The first two analyses in the grade score series, Tables XXXIV and XXXV showed highly significant "F's" for group differences. Similarly significant "F's" were seen in Tables XXXVI and XXXVII for Arithmetic in the achievement test score series. On the hypothesis that

this might have been due to the differences in vision between the two groups, three analysis of variance, Tables LXXVIII through LXXX were calculated on that basis using Arithmetic as the dependent variable. In none of these was the group difference found to be significant. The question as to why the two groups showed this important difference only in the area of Arithmetic was not answered by this study.

It would appear that with the exception noted above there was no evidence which would lead to the rejection of the null-hypothesis that there was no difference other than could be attributed to chance difference between the academic achievement of the Retrolental Fibroplasic Group and the Composite Group of subjects as measured by the Stanford Achievement Tests. Further, it appeared that there was none other than chance difference between the two groups in academic grade scores. It was also inferred that there were none other than chance differences in academic achievement test scores and academic grade scores among diagnostic categories of the study population.

TABLE XXXIII

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN ARITHMETIC FOR 20 RETROLENTAL FIBROPLASIC AND 20 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	1386.8	1	1386.8	14.68**
Trials	423.5	2	211.7	9.58**
Group/Trials Interaction	105.5	2	52.7	2.38
Subject	3593.1	38	94.5	4.28**
Residual	1684.4	76	22.1	
Total	7193.3	119		

**Significant at .01 level

TABLE XXXIV

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN ARITHMETIC FOR 39 RETROLENTAL FIBROPLASIC AND 23 COMPOSITE GROUP SUBJECTS, MODEL VI

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	1167.1	1	1167.1	14.75**
Trials	.7	1	.7	.03
Group/Trials Interaction	126.2	1	126.2	4.61*
Subject	4747.2	60	79.1	2.89**
Residual	1648.1	60	27.4	
Total	7689.3	123		

*Significant at .05 level
**Significant at .01 level

TABLE XXXV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 23 RETROLENTAL FIBROPLASIC AND 13 COMPOSITE GROUP SUBJECTS, MODEL I

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	886.66	1	886.66	5.17*
Trials	3107.35	1	3107.35	112.50**
Group/Trials Interaction	13.90	1	13.90	.50
Subject	5834.83	34	171.61	6.21**
Residual	939.25	34	27.62	
Total	10781.99	71		

*Significant at .05 level
**Significant at .01 level

TABLE XXXVI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 26 RETROLENTAL FIBROPLASIC AND 17 COMPOSITE GROUP SUBJECTS MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	1592.84	1	1592.84	7.12*
Trials	5979.45	2	2989.72	110.08**
Group/Trials Interaction	116.61	2	58.30	2.15
Subject	9174.21	41	223.76	8.24**
Residual	2227.28	82	27.16	
Total	19090.39	128		

*Significant at .05 level
**Significant at .01 level

II. SUB-GROUP EXPOSITION

In the statistical exposition of the population, a number of sub-groups were devised in order both to facilitate and to intensify the nature of the analysis. Such sub-groups were treated as discreet entities in terms of the objectives of the study. As a result, individual subjects in the study were subjected to analyses on the basis of the diagnosis of their optical pathology as well as on the basis of any other special characteristics which tended to make them unique when grouped with other subjects having similar special characteristics.

Certain tendencies were seen to be associated with the various sub-groups. It was thought that such tendencies warranted special comment.

Retrolental Fibroplasic Group. In considering Table II it was seen that 71 Retrolental Fibroplasic subjects were in the chronological age range eight through fifteen. Such subjects were born during the years preceding an understanding of the role of oxygen in the development of the disease. It was interesting to note that eight subjects who were diagnosed as having received their visual handicap from Retrolental Fibroplasia were born prior to the first published description of the condition.[4]

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[4]T. L. Terry, "Extreme Prematurity and Fibroplasic Overgrowth of Persistent Vascular Sheath Behind Crystalline Lens," American Journal of Ophthalmology, 25:203-204, February, 1942.

The division of sex within the Retrolental Fibroplasic Group, thirty-eight males to forty-one females, was more equal than Kirby's proportion of one hundred and thirty-one males to one hundred females in the blind school-age population, and it approximated conclusions of studies which showed a more equal sex division in the Retrolental Fibroplasic population.[5]

As was to be expected, and as was shown in Table IV, the majority of Retrolental Fibroplasic subjects were in the Fourth through Eighth grade range. Such grade placements were commensurate with the chronological age development of the disease entity group.

The distribution of subjects among the various sections as Table V showed a preponderance in A and B placements. However, when a comparison was made with the distribution of intelligence for this group, it was seen that six subjects who were below average in tested intelligence were placed in sections which would seem to require average intelligence.

Table VI indicated that those subjects affected by Retrolental Fibroplasia were present in all of the sub-groups which were developed for this study. Their proportional representation in the Visual Response Group was less than

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[5]C. Edith Kerby, "Causes of Blindness in Children of School Age," Sight Saving Review, 28:11, Spring, 1958; Hugh Ryan, "Retrolental Fibroplasia," American Journal of Ophthalmology, 35:330-331, March 1952; V. Everett Kinsey and Leona Zacharias, "Retrolental Fibroplasia," Journal of the American Medical Association, 139:576-578, February, 1949.

their proportion in the total population of the study. Only 13.9% of retrolental fibroplasic subjects responded to visual stimulation whereas subjects with that diagnosis of optical pathology constituted 47.5% of the study population.

As Table VIII showed, the majority of retrolental fibroplasic subjects who were multiply handicapped were affected by cerebral palsy. However, the number of subjects with that stigmata of brain damage, 6.3%, was so small in relation to the total number of Retrolental Fibroplasic subjects that the writer felt for this study's population, brain injury of the type referred to as cerebral palsy tended to be less common than earlier studies suggested.[6]

Intelligence, as measured by tests and as indicated in Table VIIX was largely Average for the retrolental fibroplasic subjects. There was a slight, though not significant indication of above average intelligence for the Retrolental Fibroplasic Group as the mean was two-tenths of a point above the range for the Average category.

Of the twenty-six subjects who had guidance referrals, ten or 38.4% had such referrals for reasons of family or family/behavior. No other subgroup had so many referrals of these types and the writer felt that the findings might tend to support other studies which pertained to intra-family

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[6]Thaddeus S. Szewczyk, "Retrolental Fibroplasia: Etiology and Prophylaxis," American Journal of Ophthalmology, 34:1649-1650, December, 1951.

difficulties when retrolental fibroplasia was involved.[7]

Conduct and Effort for the subjects was, most usually, Good to Excellent for both categories. The mean for Conduct was 2.2 while that for Effort was 2.7.[8]

Composite Group. The chronological age distribution of subjects in the Composite Group as shown in Table II, included representation in all of the age categories which were considered in the study. The mean chronological age for this group was 14.2 years as opposed to 12.1 years in the Retrolental Fibroplasic Group. It might be inferred from these data that more of the subjects in the Composite Group were entering the school for the blind at a later age than the Retrolental Fibroplasic subjects. The suggestion here was that visual handicap in the Composite Group may have been more usually progressive or traumatic than congential.

The division of sexes in the Composite Group, as noted in Table III was somewhat more in accordance with Kerby's findings than was the case with the Retrolental Fibroplasic Group,

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[7]Jane Hallenback, "Pseudo-Retardation in Retrolental Fibroplasia," New Outlook for the Blind, 48:301-307, November, 1954; H. Barry, Jr. and Frances E. Marshall, "Maladjustment and Maternal Rejection in Retrolental Fibroplasia," Mental Hygiene, 37:570-580, October, 1953.

[8]In calculating the numerical counterpart for the grades in Conduct and Effort a value of three was given for Excellent, two for Good, one for Fair-Satisfactory, and zero for Poor.

though still not in the proportion of one female to 1.31 males.[9] The ratio was one to 1.23.

The distribution of Composite Group subjects throughout the grade range was not significantly at variance with what would be expected when the over-all intelligence of the subject was examined. However, it was noted in Table IV that the Composite Group had more than two subjects in Special Class to every retrolental fibroplasic. It was the writer's feeling that the small number of subjects involved would tend to make any generalization on the point extremely hazardous.

It was seen from Table VI that the specific diagnoses of cataracts and buphthalmus-glaucoma were the most common in the Composite Group. It was, however, also seen that the largest diagnostic category was the inclusive designation of "other." Those subjects displayed a great variety of differing diagnoses of visual handicap, though there were not enough subjects within a single diagnosis to warrant their being grouped under a separate pathology heading.

Fifteen or 17.2% of the subjects in the Composite Group had handicaps in addition to their visual impairment. Table VIII showed that speech was the predominant additional handicap, with cerebral palsy the next most common. It was noted that problems of speech which affected 8% of the group were .2% more common than in the general New England population of

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[9]Kerby, loc. cit.

school-age children.[10]

Intelligence, as determined by tests and indicated in Table IX showed that it was not significantly more likely for a Composite Group subject to be above the average than below average. However, it was seen that there was more possibility of a subject being Very Superior in intelligence than Mentally Defective. The former category had 11.4% of the subjects while the latter had 3.4%.

That those of the Composite Group who had guidance referrals were more likely to have two or more referrals was indicated in Table X. Referrals for reasons of behavior or family-behavior accounted for 42.8% of all types of referrals in this group. There were no referrals under the single category, Family. The Composite Group had 7.3% more subjects sent to the Guidance Committee than did the Retrolental Fibroplasic Group.

It was interesting to note from the data presented in Table XV that 57.4% of the Composite Group responded to visual stimulation, whereas only 13.9% of retrolental fibroplasic subjects responded. The writer viewed such figures as indicating the severe visual effect of retrolental fibroplasia on its victims in the study population.

Superior Intelligence Group. The members of this group

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[10] "A Survey of Services for the Speech and Hearing Handicapped in New England," 16:148-156, cited by Harry J. Baker, Introduction to Exceptional Children (third edition; New York: The Macmillan Company, 1959), p. 391.

tended to be distributed along the chronological age range of the over-all study population. Though there was larger numerical representation at ages nine and eleven than in other age categories, such clustering appeared to be without significance.

The division of sexes in the Superior Intelligence Group, as was shown in Table III was different from that of the over-all population of the study. However, the ratio of one female to 1.6 males did not appear to warrant any inferences owing to the limited number of subjects involved.

Table IV, which indicated grade distribution for this group, showed that they were represented in all but one grade. The largest single group of subjects whose intelligence was Superior or Very Superior was in Grade Ten.

As was to be expected, the Superior Intelligence Group was predominantly placed in A Sections. It might be inferred that the two subjects in B Sections were under achieving in terms of their potential.

In this group more members were visually impaired from retrolental fibroplasia than from any other cause. However, in that retrolental fibroplasic subjects constituted the largest single ocular pathology group in the study's population and, further, in that they did not indicate any gross deviation from other diagnostic groups in terms of the data of the study, it was to be expected that their representation would be large. There was only .8% difference between retrolental fibroplasic proportional representation in the Superior

Intelligence Group and their proportion in the total study population.

It was noted in Table VII that no subjects in the Superior Intelligence Group had multiple handicaps. It was thought by the writer that the absence of a handicap concomitant with blindness could mean either that those subjects without multiple handicaps were more intelligent or that they were able to express their intelligence at a higher level than those with multiple handicaps. Conversely, it was thought that additional handicaps might tend to delimit intelligence or the expression of intelligence. However, any such inferences would have to be extremely tentative owing to the limited number of subjects which were considered.

Guidance referrals for subjects in the Superior Intelligence Group were infrequent, though one subject did have six referrals.

Conduct and Effort for the Superior Intelligence Group tended to be Good rather than Excellent. Any inferences to be drawn from such data as indicated in Tables XIII and XIV would be extremely tenuous. However, one might postulate when considering Effort that the group tended to make less effort than might be hoped for in students whose intelligence was so markedly above normal. However, nothing could be said or inferred about curriculum, or instruction in that regard.

Only five, or 19.2% of the subjects in the Superior Intelligence Group responded to visual stimulation. It might

be inferred that lack of visual response in the population which was considered in this study did not appear to hamper the expression of superior intelligence.

Special Class or its equivalent group. The chronological age range for the Special Class Group tended to be restricted with 68.7% of these in the range eleven to fourteen years. It was felt that the restriction at the upper end of the chronological range was due, in part, to the fact that there may have been a tendency for Special Class students to drop out of the school program once the age limit for compulsory school attendance was reached. The restriction at the lower end of the age range may have resulted from the fact that individuals with questionable intelligence were entered at the Perkins School for a period of observation in order to determine whether their apparent retardation resulted from social and emotional conditions. However, once it was determined that an individual was retarded to the extent that little was to be gained by continued exposure to a program, such as was conducted at the Perkins School, he was referred to other more appropriate facilities. In effect, such a policy may have led to the dismissal of individuals who were intellectually handicapped at an early age and, therefore, restricted representation in the lower chronological age categories. It was necessary to assume that the Special Class Group was not representative of the lower intellectual limits of a general population of school-age blind children.

The equal division of sexes in the Special Class Group was noted in Table III. While the number of subjects in the group was small, there was, nonetheless, the fact that 6.1% more females were in the Special Class Group than was their proportion in the total study population.

It was noted in Table VI that retrolental fibroplasia was the largest diagnostic category in the Special Class Group. However, such representation was 16.3% below their proportion in the over-all population of the study.

Seven of the sixteen subjects in the Special Class Group were multiply handicapped. Such a proportion might tend to support the suggestion which was previously made that an additional handicap might limit intelligence or preclude the expression of full intellectual ability or, as another suggestion, that an additional handicap might tend to indicate a large probability of poor academic performance.

The distribution of types of multiple handicaps, as was seen in Table VIII was not of such a nature as to suggest any basis for generalization. There was some indication that those subjects in the study population who had cerebral palsy might tend to be in the Special Class Group. However, the number of subjects was so small -- three of nine cerebral palsied -- as to suggest extreme caution in generalizing.

In referring to intelligence, it was seen in Table IX that one subject in the Special Class Group had Average Intelligence, while the remaining subjects were in various categories

below that designation of tested intelligence. That single subject, number ninety-nine, was in the Special Class of the lower school. The subject had, at one time, been in a regular grade, but had subsequently been transferred to the Special Class. His achievement test scores and academic grades showed extreme fluctuation and variability. As regards the remainder of the Special Class Group, there was nothing in their intelligence test scores to indicate that such placement was unwarranted except for the fact of common knowledge that individuals with Dull-Normal intelligence are often in regular classrooms.

All but four members of the Special Class Group had guidance referrals, as was noted in Table X. The table also indicated that those subjects having guidance referrals tended to have multiple referrals, but, as Table XIshowed, there was no marked clustering as to the type of referral, though the category behavior/scholastic was the most common type of referral. However, when those whose referrals were of the type behavior-scholastic were grouped with those whose referral was either for behavior or scholastic, it was seen that the total number of subjects constituted half of those who had guidance referrals. It might be inferred from such a grouping that there was a tendency for the Special Class Group subjects in the population of the study who had guidance referrals to have had them as a result of behavior or scholastic problems and that such problems were interactive.

Conduct for the subjects in this group was somewhat

more uniform than Effort. One-third of the subjects in the Special Class Group on whom data were collected made only Fair Effort, whereas Conduct was at Least Good in three-quarters of the subjects, with no subjects having received a rating of Fair in that particular category.

Table XV indicated that five, or 31.2% of the sixteen subjects in the Special Class Group responded to visual stimulation. The ability to respond visually did not appear to insure that those with such ability would have any special academic advantage over those who did not.

Multiply Handicapped Group. On examination of the chronological age range for the Multiply Handicapped Group in Table II, it was seen that half the subjects in the group were thirteen or fourteen years of age.

The grade distribution of multiply handicapped subjects was noted in Table IV. As the majority of the subjects in this study were in the grade range Fourth through Eighth, so were the majority of multiply handicapped subjects. It was, however, noted that 28.9% of the group were in Special Class. Such a prevalence was commented on in the study section dealing with the Special Class Group.

Sectional placement of multiply handicapped subjects was noted in Table V. It was seen that 62.5% of the subjects were in A or B Sections. When this information was coupled with that of Table IX, pertaining to intelligence, and when it was noted that 58.3% of the subjects were placed in cate-

gories of tested intelligence below the Average, one might tend to infer that the group was performing somewhat better in the academic sphere than tested intelligence would indicate them capable of doing. Owing to the small number of subjects no generalizations were felt to be warranted though further study with larger samples would seem to be suggested.

While the largest single diagnostic category in the Multiply Handicapped Group was that of retrolental fibroplasia, the proportion of representatives was 10% below that of the diagnostic groups representation in the over-all group of study subjects. It was seen further, in Table VI, that, in relation to the number of subjects in any given diagnostic category, the optic atrophy category had more than half of its subjects multiply handicapped.

Cerebral palsy and speech were the most common multiple handicaps in the group. The former category also included subjects with speech handicaps as an aspect of cerebral palsy involvement.

Multiply handicapped subjects having guidance referrals had, most commonly, more than one such referral. As was to be expected with multiple handicaps, a number of guidance referrals were of the physical type, though the largest representation was in the behavior-scholastic category. However, 62.5% of the subjects had diagnosis other than retrolental fibroplasia and for all such subjects in the study population, behavior or behavior-scholastic referrals were the most common.

Almost as many subjects responded to visual stimulation, 45.4%, as did not in the Multiply Handicapped Group. The relationship of multiple handicap to visual response was unclear.

Visual Response Group. The chronological age range for this group, tended to show visual response subjects were somewhat older than subjects in the Retrolental Fibroplasic Group. The reason for such a finding, in part, appeared to be that retrolental fibroplasics, a diagnostic category which was predominantly unresponsive to visual stimulation, were concentrated in the age range nine to thirteen and as they formed the bulk of subjects in that range, it was natural for those who did respond to visual stimulation to be concentrated in other age categories. Fifty-four per cent of visual response subjects were older than thirteen.

Little could be inferred from the division of sexes in the Visual Response Group. Among reasons for caution here was that visual response ranged from object perception by some subjects to the designation of absence or presence of light by others. Such heterogeneity of abilities would tend to make any generalizations precarious.

Thirty-one per cent of visual response subjects were outside of the grade range in which retrolental fibroplasic subjects were concentrated. The reason again was similar to that suggested for the age range differential between the two groups -- the retrolental fibroplasic subjects were predomi-

nantly totally blind and were concentrated in a five grade range.

In examining the distribution of diagnoses for the group, which was presented in Table VI, it was noted that a number of diagnostic categories had a majority of their membership responding to visual stimulation, whereas others had negligible numbers responding or none at all. Retrolental fibroplasia, with 13.9% respondents, and retinoblastoma, with no respondents, were the categories with the least proportionate representation in the Visual Response Group while retinitis pigmentosa, with 85.8% respondents, had the largest representation. In the general study population 36.7% of the subjects were visually responsive.

The distribution of intelligence for the group, as noted in Table IX suggested that lack of visual response was associated with higher intelligence test scores. Only 19.6% tested above the Average category, whereas 39.3% tested below average. Owing to the variability in levels of visual response, the writer felt that no hypothesis was warranted. Further, more controlled research, however, was felt to be indicated.

Intensive Grade Range Group. The Intensive Grade Range Group included all subjects in the Fourth through Eighth Grades. Chronological age distribution for the group was seen in Table II, and it was noted that subjects were older for grade placement than what might have been expected in the

general population of Fourth to Eighth Graders[1]. The discrepancy resulted, in part, from the inclusion of Seventh Ungraded in the intensive grade range, but also, and more importantly, from the fact that blind children tend to be over a year retarded in grade placement as compared with their normally sighted peers.[11]

The division of sexes as noted in Table III indicated that there were proportionately more males in the intensive grade range than females when considering the distribution in the total study population. However, the difference of 4.7% was not felt to be significant even though the retrolental fibroplasic population with its nearly equal sex distribution was so heavily represented in these grades. The preponderance of males in the optic atrophy and buphthalmus/glaucoma diagnostic categories in the intensive grade range accounted for the difference.

As was to be expected, retrolental fibroplasia was the major diagnostic category and Table VI indicated that fact. These were the grades where that school-age blind population was making itself felt.

In that the bulk of subjects in the study population were in the Intensive Grade Range Group, it was natural that the majority, or 66.6% of multiply handicapped subjects should

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[11] Edward J. Waterhouse, "One Hundred Twenty-Fourth Report of the Director," One Hundred and Twenty-Fourth Annual Report of Perkins Institution and Massachusetts School for the Blind (Watertown, Massachusetts: The Eaton Press, 1955), pp. 35-36.

also be in that range. Such was the case, as Table VII indicated. As was also to be expected, a majority of the types of additional handicaps were represented in the multiply handicapped subjects in the Intensive Grade Range Group.

The distribution of intelligence, as shown in Table IX was not remarkable in any statistical sense. The upper two categories of intelligence tended to have slightly less proportional representations than they did in the total study population but the 2.4% difference was not felt to have special significance.

Guidance referrals were more common in this group than in any other sub-group of the study population. This was expected because the Intensive Grade Range Group was the largest sub-group. It was thought, however, that referrals for reasons of family or family-behavior would be the most common owing to the large number of retrolental fibroplasic subjects. It was noted that behavior and behavior-scholastic referrals were 6.7% more common than family referrals or any of its combinations. The expected result was cancelled by the presence of other than retrolental fibroplasic subjects whose referrals were preponderantly behavior and behavior-scholastic and never family.

As in all of the subgroups of the study population, environmental manipulation was the most frequent means of disposition for guidance referrals. The effect of environmental manipulation on the subject whose type of referral was

Family was not clear to the writer.

Visual response in the Intensive Grade Range Group was 3.7% less than the proportion of visual response in the total population of this study. This condition was, again, influenced by the predominance of retrolental fibroplasic subjects with their low incidence of visual response.

Diagnostic Groups. Seven of the more common diagnostic categories of ocular pathology in the population of this study were determined and subjects grouped accordingly. The chronological age distribution for the diagnostic groups was shown in Table XVI. It was seen that the retrolental fibroplasic category contributed substantial numbers of subjects through the fourteenth chronological year. It was also seen that the other diagnostic groups tended to cluster in the age range eleven through eighteen years of age. It was apparent that had the retrolental fibroplasic subjects been removed, the remaining population would have been quite restricted in number. Such results seemed to substantiate Kirby's contention as to the impact of the numbers of retrolental fibroplasia on the population of blind school-age children.[12] The small numbers in the diagnostic categories other than retrolental fibroplasia tended to suggest to the writer that conditions causing ocular pathology might be showing the effect of improved medical procedures, and,

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[12]Kirby, op. cit., p. 28.

therefore, lesser numbers of individuals were being added to the blind school-age population.

The distribution of the diagnostic categories throughout the grades, as noted in Table XVIII tended to be as was expected when consideration was given to chronological age. However, it was also noted that the over-all group was retarded as regards grade placement when compared with sighted peers of a similar chronological age. Such a phenomenon has been commented on in the literature.[13]

Table XIX, which referred to the sectional distribution of the diagnostic groups, suggested some inferences. However, once again, such inferences were tentative owing to the limitations in numbers of subjects. It was noted that 80% of subjects with retinoblastoma were in A Sections. However, that diagnostic category contained only 5 subjects or 3.01% of the study population. It was seen also that no category contributed as much as half of its membership to the Special Class placement. However, the total showed that when consideration was given to Section C and Special Class, that 6 or 31% of the buphthalmus-glaucoma group were in such inferior academic placements.

The optic atrophy category was seen in Table XX to have 5 or 55.5% of its subjects with additional handicaps. No other category had so large a percentage of additionally handicapped subjects. Retinitis pigmentosa and retinoblastoma

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[13] Waterhouse, loc. cit.

categories were without additional handicapped members. In the remaining categories, buphthalmus-glaucoma, with one in nineteen, had proportionately less members with additional handicaps than any other group.

While cerebral palsy was the second most common additional handicap in the study population, it was, in those diagnostic groups in which it was found, the most common additional handicap. As Table XXI indicated, the optic atrophies and the retrolental fibroplasic had more cerebral palsied subjects than any of the other types of additional handicaps. It was seen also that problems of speech were the sole type of additional handicap in the cataract category. This finding was at variance with expectations as the literature led the writer to feel that cerebral palsy and epilepsy might be more common in cataract cases.[14]

The tested intelligence of the various diagnostic groups was shown in Table XXII. Sixty per cent of the retinoblastoma subjects were in the Very Superior category, while subjects with amblyopia were as often below average in intelligence as they were Average or above. It was interesting to note that the sectional placement of retinoblastoma subjects in the various grades tended to give support to indications of above average intelligence, whereas the anblyopias half

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[14]Arthur H. Parmelee Jr., Margery Gilbert Cutsforth, and Claire L. Jackson, "Mental Development of Children with Blindness Due to Retrolental Fibroplasia," American Medical Journal of Diseases of Children, 96:653, December, 1958.

of whom were in A Sections seemed to be somewhat more superior in academic performance as measured by sectional placement than tested intelligence would have anticipated.

When consideration was given to the total number of subjects in the various diagnostic categories, it was seen that there were twice as many subjects in the Very Superior category of tested intelligence as in the Mentally Defective category. However, the numbers -- fourteen and seven -- were so small in relation to the size of the study population as to suggest caution in generalizing.

Table XXIII, which indicated the status of visual response for various diagnostic groups, showed that only the retinoblastoma category was without any subjects responding to visual stimulation. For the remaining groups, and with the exception of retrolental fibroplasia, it was seen that visual response was more likely than lack of such response in six of the seven groups.

In considering Table XXIV, as it noted types of guidance referrals, it was noted that referrals for reasons of family or family/behavior were most frequent with retrolental fibroplastic subjects. Such a finding has been commented on in the literature.[15] In addition, it was noted that for two diagnostic categories, guidance referrals were more common for the membership than uncommon. Such was the case in optic atrophy and amblyopia. In the former categorie 57.1% of those

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[15]Hallenbeck, loc. cit.

on whom information was available were seen by the Guidance Committee while 66.6% of the latter group also had guidance referrals.

In regard to Conduct and Effort, as shown in Tables XXVI and XXVII, no diagnoses were particularly associated with either Poor Conduct or Poor Effort.

SUMMARY

Consideration was given to techniques of statistical analysis and results of such analysis. It was seen that for the population of the study, with one exception, none other than chance differences existed between the Retrolental Fibroplasic Group and a Composite Group of diverse diagnoses in terms of academic achievement test scores and academic grade scores. It was inferred that a similar null hypothesis was substantiated for the various diagnostic groups other than retrolental fibroplasia. Further, it was seen that within the limitations of the study data and techniques no important differences were found between diagnostic groups in tested intelligence. It was also seen that differences in social adjustment were in kind rather than degree.

The subgroups of the study population were discussed singly and in relation to the performance of other subgroups. Further, consideration was given to the seven diagnostic categories of visual defect, and especially to characteristics which seemed to have been associated with particular

diagnoses.

It was noted that while inferences could be made as to subgroup peculiarities on various aspects of the study data, such inferences tended to be guarded owing to the restricted number of subjects.

On the basis of the findings in this study, it did not appear as if any curricula changes were warranted for the retrolental fibroplasics, per se. The group was able to cope with the academic demands of the residential school at least as well as any of the other ocular pathology groups. In addition, the study did not present any basis for modifying the social environment of the Retrolental Fibroplasic Group.

CHAPTER V

SUMMARY, LIMITATIONS OF THE STUDY, AND CONCLUSIONS

I. SUMMARY

This study was concerned with the academic achievement, intellectual status, and social adjustment of a residential school population of children and youth, blind as a result of retrolental fibroplasia. The Retrolental Fibroplasic Group was compared with children and youth blind for a variety of reasons and at the same residential school. The purpose of the analyses and comparisons was that of obtaining information as to the academic, intellectual, and social character of the Retrolental Fibroplasic Group in order to determine their effect on a general residential school population of one hundred and sixty-eight blind children and youth. A further objective of the study was that of exposing any special characteristics which might be associated with particular diagnostic categories of visual disease, including retrolental fibroplasia, cataracts, retinitis pigmentosa, buphthalmus/glaucoma, optic atrophy, amblyopia, retinalblastoma, and a heterogeneous group of diagnoses.

In order to accomplish these objectives, data were collected on the sex, age, grade placement, diagnoses of optical pathology, visual response, presence of and type of additional handicaps, guidance referrals, including numbers,

type and disposition of such referrals, as well as tested intelligence, conduct, effort, achievement test performance, and academic grade scores for the 166 members of the study population.

In an attempt to utilize the data in an exacting way and to provide for sensitive comparisons, subjects showing similar characteristics were grouped and treated as distinct entities. Such subgroups included the Visual Response Group, Special Class Group, Multiply Handicapped Group, Superior Intelligence Group, Intensive Grade Range Group, and, where practical, all of the subjects showing similar diagnoses of optical pathology. An additional sub-group known as the Composite Group and containing all subjects with a diagnosis other than retrolental fibroplasia was also utilized.

A review of the literature pertaining to the disease retrolental fibroplasia was made. The review contained sections on the nature and course of retrolental fibroplasia, incidence of retrolental fibroplasia, mental development of children affected by retrolental fibroplasia, academic achievement of retrolental fibroplasic children, etiology, prophylaxis, and present status of retrolental fibroplasia, as well as limitations of previous studies regarding the disease.

An exposition was made of the material and methods necessary for the realization of the objectives of this study. The academic achievement tests and measures which were utilized were discussed, as well as various adaptations necessary

for the utilization of standardized achievement tests with the visually handicapped population. Similarly, the objective measures of intelligence were presented and discussed as were also the adaptations which made such tests suitable for a population of the type used in this study. Sources of information as to diagnostic groupings were noted, as was also the basis of information involved in the utilizations and discussion of guidance referrals, and for the development of the various sub-groups of the study population.

Information regarding the techniques and results of statistical analysis was presented. The null-hypothesis as to there being no difference other than could be attributed to chance between a group of subjects blind as a result of retrolental fibroplasia and another group of subjects with diverse diagnoses was introduced. Forty-seven analyses of variance were presented as were also models supporting the means by which such analyses were used. Intro-group and inter-group comparisons of sex, age, grade placement, visual status, incidence of additional handicap, guidance referrals and their characteristics, intelligence, conduct and effort, as they pertained to the retrolental fibroplasic subjects and to the various other diagnostic group and other sub-group subjects were also made.

Inferences were drawn from the statistical analysis as to the characteristics of the various diagnostic groups and other sub-groups. The limitations of the study were discussed

and generalized conclusions presented.

II. LIMITATIONS OF THE STUDY

At least three problems are inherent in research dealing with blind children and youth and this study was affected by each of them. The first problem is that of adequate sampling. The severely visually handicapped youngster is a rarity when considered in terms of the total population of children and youth. These handicapped children are scattered throughout the nation and a representative sample would be virtually impossible to secure. In consequence this study used a residential school population of blind children and youth drawn, primarily, from a five state region and with the knowledge that this group could only approximate a random sample.

The second problem which obtains in research dealing with the severely visually handicapped is that of gross data regarding visual levels. For example, as of the present the skills and tools of ophthalmology are not such as to take the subjective element out of visual evaluations. As a result it was not uncommon for the writer to review such a report as "he was able to see two fingers at about one foot" or "she seems to have light perception today." In consequence the research worker must impose his judgment on the data and both he and the reader must realize the finite nature of the material.

The third problem common to research with blind children

and youth concerns the instruments used in intellectual and academic evaluations. Such tests as are now being used have been adapted from tests constructed for and standardized on sighted populations. Because the history of testing as it affects the visually handicapped is of short duration the adaptations have not been fully standardized. Until they are, all research findings pertaining to the intellectual and academic functioning of these children will be tentative and judgment will need to be suspended.

Some data which were used in this study were compiled from the past records and reports of the Perkins School rather than by the writer having collected them himself. As a result, there may have been errors in the original computations or reports which could not have been known to the writer. The chance that such errors existed, and, further, that they were of such a magnitude as to affect the study conclusions is remote. However, they may have existed and the possibility should not be ignored.

III. FINDINGS AND CONCLUSIONS

It was concluded, within the limitations of methods and subjects used in this study, that school-age individuals with visual handicaps resulting from retrolental fibroplasia were almost consistently not significantly different from their visually handicapped peers with a variety of diagnoses of visual pathology. Although these retrolental fibroplasic

children tended to be clustered in a particular grade range, and to be more evenly divided in sex distribution than children otherwise visually impaired, no significant differences were found between the retrolental fibroplasic subjects and the visually handicapped children with whom they were compared in relation to intelligence test performance. In addition the retrolental fibroplasic subjects were not significantly different from other diagnostic categories in academic performance with the exception of Arithmetic, in which case the retrolental fibroplasic subjects revealed significantly higher achievement. Finally, the social adjustment of subjects visually handicapped as a result of retrolental fibroplasia was not markedly at variance with the social adjustment displayed by their peers who were visually handicapped for a variety of other reasons.

In conclusion, in order to substantiate further the inferences and conclusions of this study, larger groups of randomly selected subjects would need to be utilized in a more extensive and intensive study. Such a study might give particular attention to the functioning of visual response subjects in order to determine whether such subjects are penalized for "visual behavior" in an environment that places a premium on "blind behavior".

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APPENDIX

TABLE XXXVII

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN SCIENCE FOR 39 RETROLENTAL FIBROPLASIC AND 24 COMPOSITE GROUP SUBJECTS, MODEL VI

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	205.6	1	205.6	2.55
Trials	153.6	1	153.6	6.59*
Group Trials/ Interaction	11.2	1	11.2	.48
Subject	4921.6	61	80.6	3.46**
Residual	1425.2	61	23.3	
Total	6717.2	125		

*Significant at .05 level
**Significant at .01 level

Total doesn't add up correctly

TABLE XXXVIII

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN READING FOR 19 RETROLENTAL FIBROPLASIC AND 21 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	24.0	1	24.0	.35
Trials	88.6	2	44.3	1.81
Group/Trials Interaction	129.0	2	64.5	2.63
Subjects	2586.0	38	68.0	2.78**
Residual	1862.4	76	24.5	
Total	4690.0	119		

**Significant at .01 level

TABLE XXXIX

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN READING FOR 38 RETROLENTAL FIBROPLASIC AND 21 COMPOSITE GROUP SUBJECTS, MODEL VI

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	5.9	1	5.9	.08
Trials	29.1	1	29.1	1.65
Group Trials/ Interaction	15.0	1	15.0	.85
Subject	4321.0	60	72.0	4.09**
Residual	1060.9	60	17.6	
Total	5431.9	123		

**Significant at .05 level

TABLE XL

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN SOCIAL STUDIES FOR 39 RETROLENTAL FIBROPLASIC AND 24 COMPOSITE GROUP SUBJECTS, MODEL VI

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	91.9	1	91.9	.87
Trials	66.7	1	66.7	3.03
Group Trials/ Interaction	5.2	1	5.2	.24
Subject	6460.2	61	105.9	4.81**
Residual	1343.1	61	22.0	
Total	7967.1	125		

**Significant at .01 level

TABLE XLI

ANALYSIS OF VARIANCE: ACADEMIC GRADE SCORES IN SOCIAL STUDIES FOR 20 RETROLENTAL FIBROPLASIC AND 21 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	31.4	1	31.4	.34
Trials	324.9	2	162.4	4.76*
Group Trials/ Interaction	143.4	2	71.7	2.10
Subject	3619.3	39	92.8	2.72
Residual	2665.1	78	34.1	
Total	6784.1	122		

*Significant at .05 level

TABLE XLII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SPELLING FOR 21 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	115.34	1	115.34	.22
Trials	7004.31	2	3502.15	60.04**
Group Trials/ Interaction	9.04	2	4.52	.08
Subject	20165.16	38	530.66	9.10**
Residual	4433.32	76	58.33	
Total	31727.17	119		

**Significant at .01 level

TABLE XLIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SPELLING FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	115.56	1	115.56	.14
Trials	9327.56	3	3109.18	36.87**
Group Trials/ Interaction	280.07	3	93.35	1.11
Subject	11216.88	14	801.20	9.50**
Residual	3541.87	42	84.33	
Total	24481.94	63		

**Significant at .01 level

TABLE XLIV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SOCIAL STUDIES FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	495.06	1	495.06	.29
Trials	6450.56	3	2150.18	27.31**
Group Trials/ Interaction	91.82	3	30.60	.39
Subject	23902.88	14	1707.34	21.68**
Residual	3307.12	42	78.74	
Total	34247.44	63		

**Significant at .01 level

TABLE XLV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SPELLING FOR 26 RETROLENTAL FIBROPLASIC AND 17 COMPOSITE GROUP SUBJECTS, MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	9.47	1	9.47	.02
Trials	7523.72	2	3761.86	106.21**
Group Trials/ Interaction	41.65	2	20.82	.59
Subject	16929.43	41	412.91	11.66**
Residual	2904.63	82	35.42	
Total	27408.90	128		

**Significant at .01 level

TABLE XLVI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SOCIAL STUDIES FOR 26 RETROLENTAL FIBROPLASIC AND 17 COMPOSITE GROUP SUBJECTS, MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	194.24	1	194.24	.33
Trials	7855.67	2	3927.83	66.40**
Group Trials/ Interaction	55.93	2	27.96	.47
Subject	23948.09	41	584.09	9.87**
Residual	4850.40	82	59.15	
Total	36904.33	128		

**Significant at .01 level

TABLE XLVII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SOCIAL STUDIES FOR 20 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	99.56	1	99.56	.09
Trials	3728.93	2	1864.46	11.87**
Group Trials Interaction	74.94	2	37.47	.24
Subject	42715.63	37	1154.47	7.35**
Residual	11625.47	74	157.10	
Total	58244.53	116		

**Significant at .01 level

TABLE XLVIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 35 RETROLENTAL FIBROPLASIC AND 28 COMPOSITE GROUP SUBJECTS, MODEL IV

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	400.79	1	400.79	.63
Trials	2533.52	1	2533.52	28.84**
Group Trials/ Interaction	28.73	1	28.73	.33
Subject	38814.21	61	636.29	7.24**
Residual	5358.25	61	87.84	
Total	47135.50	125		

**Significant at .01 level

TABLE IL

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	37.51	1	37.51	.03
Trials	10948.42	3	3649.47	23.62**
Group Trials/ Interaction	98.30	3	32.76	.21
Subject	18982.60	14	1355.90	8.78**
Residual	6489.53	42	154.51	
Total	36556.36	63		

**Significant at .01 level

TABLE L

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 26 RETROLENTAL FIBROPLASIC AND 17 COMPOSITE GROUP SUBJECTS, MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	201.31	1	201.31	.31
Trials	8610.05	2	4305.02	34.90**
Group Trials/ Interaction	63.55	2	31.77	.26
Subject	26783.32	41	653.25	5.30
Residual	10115.74	82	123.36	
Total	45773.97	128		

**Significant at .01 level

TABLE LI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 21 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	818.97	1	818.97	.81
Trials	7083.64	2	3541.82	20.24**
Group Trials/ Interaction	313.43	2	156.71	.90
Subject	38194.99	38	1005.13	5.74**
Residual	13302.27	76	175.02	
Total	59713.30	119		

**Significant at .01 level

TABLE LII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SCIENCE FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	306.25	1	306.25	.24
Trials	12842.56	3	4280.85	67.13**
Group Trials/ Interaction	449.37	3	149.79	2.35
Subject	18106.69	14	1293.33	20.28**
Residual	2678.57	42	63.77	
Total	34383.44	63		

**Significant at .01 level

TABLE LIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 22 RETROLENTAL FIBROPLASIC AND 13 COMPOSITE GROUP SUBJECTS, MODEL I

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	1025.89	1	1025.89	1.60
Trials	2401.42	1	2401.42	19.53**
Group Trials/ Interaction	19.26	1	19.26	.16
Subject	21164.31	33	641.34	5.22**
Residual	4058.32	33	122.97	
Total	28669.20	69		

**Significant at .01 level

TABLE LIV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SCIENCE FOR 26 RETROLENTAL FIBROPLASIC AND 17 COMPOSITE GROUP SUBJECTS, MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	82.42	1	82.42	.18
Trials	6162.05	2	3081.02	39.95**
Group Trials/ Interaction	15.23	2	7.61	.10
Subject	18755.46	41	457.45	5.93**
Residual	6324.72	82	77.13	
Total	31339.88	128		

**Significant at .01 level

TABLE LV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SCIENCE FOR 21 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	10.11	1	10.11	.01
Trials	11652.34	2	5826.17	45.27**
Group Trials/ Interaction	391.53	2	195.76	1.52
Subject	4005.75	38	1054.09	8.19**
Residual	9781.47	76	128.70	
Total	61891.20	119		

**Significant at .01 level

This table does not add correctly

TABLE LVI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 21 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	776.90	1	776.90	1.43
Trials	18489.95	2	9244.97	73.38**
Group Trials/ Interaction	1167.46	2	583.73	4.63*
Subject	20686.09	38	544.37	4.32**
Residual	9575.93	76	125.99	
Total	50696.33	119		

*Significant at .05 level
**Significant at .01 level

TABLE LVII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	1305.01	1	1305.01	1.24
Trials	9767.42	3	3255.80	58.64**
Group Trials/ Interaction	136.30	3	45.43	.82
Subject	14725.85	14	1051.84	18.95**
Residual	2332.03	42	55.52	
Total	28266.61	63		

**Significant at .01 level

TABLE LVIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN LANGUAGE FOR 21 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	467.47	1	467.47	.47
Trials	5721.05	2	2860.52	13.91**
Group Trials/ Interaction	188.29	2	94.14	.46
Subject	37540.86	38	987.91	4.81
Residual	15624.66	76	205.58	
Total	59542.33	119		

**Significant at .01 level

TABLE LIX

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN LANGUAGE FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	2316.01	1	2316.01	1.41
Trials	8613.54	3	2871.18	14.60**
Group Trials/ Interaction	360.18	3	120.06	.61
Subject	23031.85	14	1645.13	8.36**
Residual	8261.53	42	196.70	
Total	42583.11	63		

**Significant at .01 level

TABLE LX

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN LANGUAGE FOR 23 RETROLENTAL FIBROPLASIC AND 13 COMPOSITE GROUP SUBJECTS, MODEL I

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	399.05	1	399.05	.40
Trials	39.01	1	39.01	.31
Group Trials/ Interaction	139.51	1	139.51	1.13
Subject	34298.33	34	1008.77	8.15**
Residual	4210.98	34	123.85	
Total	39086.88	71		

**Significant at .01 level

TABLE LXI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN LANGUAGE FOR 26 RETROLENTAL FIBROPLASIC AND 17 COMPOSITE GROUP SUBJECTS, MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	6.92	1	6.92	.01
Trials	8494.39	2	4247.19	33.85**
Group Trials/ Interaction	241.23	2	120.61	.96
Subject	32350.74	41	789.04	6.29**
Residual	10289.72	82	125.48	
Total	51383.00	128		

**Significant at .01 level

TABLE LXII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN WORD MEANING FOR 21 RETROLENTAL FIBROPLASIC AND 19 COMPOSITE GROUP SUBJECTS, MODEL III

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	322.24	1	322.24	.37
Trials	19804.87	2	9902.43	148.00**
Group Trials/ Interaction	31.83	2	15.91	.24
Subject	32769.23	38	862.34	12.89**
Residual	5085.30	76	66.91	
Total	58013.47	119		

**Significant at .01 level

TABLE LXIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN WORD MEANING FOR 8 RETROLENTAL FIBROPLASIC AND 8 COMPOSITE GROUP SUBJECTS, MODEL V

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	1323.14	1	1323.14	1.45
Trials	20086.29	3	6695.43	124.43**
Group Trials/ Interaction	264.30	3	88.10	1.64
Subject	12783.72	14	913.12	16.97**
Residual	2260.16	42	53.81	
Total	36717.61	63		

**Significant at .01 level

TABLE LXIV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN WORD MEANING FOR 23 RETROLENTAL FIBROPLASIC AND 13 COMPOSITE GROUP SUBJECTS, MODEL I

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	29.95	1	29.95	.10
Trials	833.68	1	833.68	13.06**
Group Trials/ Interaction	27.90	1	27.90	.44
Subject	10042.21	34	295.35	4.63**
Residual	2169.92	34	63.82	
Total	13103.66	71		

**Significant at .01 level

TABLE LXV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN WORD MEANING FOR 26 RETROLENTAL FIBROPLASIC AND 18 COMPOSITE GROUP SUBJECTS, MODEL II

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	.71	1	.71	.00
Trials	6385.21	2	3192.60	104.16**
Group Trials/ Interaction	8.03	2	4.01	.13
Subject	17089.97	41	416.82	13.60**
Residual	2514.10	82	30.65	
Total	25998.02	128		

**Significant at .01 level

TABLE LXVI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN WORD MEANING FOR 11 SUBJECTS WITH AND 10 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	64.50	1	64.50	3.39
Residual	361.31	19	19.02	
Total	425.81	20		

TABLE LXVII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 10 SUBJECTS WITH AND 9 WITHOUT VISUAL RESPONSE MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	20.67	1	20.67	.25
Residual	1392.49	17	81.91	
Total	1413.16	18		

TABLE LXVIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ALL ITEMS FOR 75 SUBJECTS WITH AND 69 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	.60	1	.60	.00
Residual	23619.62	142	166.34	
Total	23620.22	143		

TABLE LXIX

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SPELLING FOR 9 SUBJECTS WITH AND 19 WITHOUT VISUAL RESPONSE,

MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	60.01	1	60.01	.45
Residual	3448.85	26	132.65	
Total	3508.86	27		

TABLE LXX

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN LANGUAGE FOR 11 SUBJECTS WITH AND 10 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	2.57	1	2.57	.01
Residual	8182.10	19	430.64	
Total	8184.67	20		

TABLE LXXI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SPELLING FOR 11 SUBJECTS WITH AND 10 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	539.16	1	539.16	2.33
Residual	4403.13	19	231.74	
Total	4942.29	20		

TABLE LXXII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SOCIAL STUDIES FOR 11 SUBJECTS WITH AND 10 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	3.82	1	3.82	.07
Residual	981.13	19	51.64	
Total	984.95	20		

TABLE LXXIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SCIENCE FOR 11 SUBJECTS WITH AND 10 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	22.30	1	22.30	.25
Residual	1688.65	19	88.88	
Total	1710.95	20		

TABLE LXXIV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN READING FOR 9 SUBJECTS WITH AND 19 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	114.06	1	114.06	.93
Residual	3198.05	26	123.00	
Total	3312.11	27		

TABLE LXXV

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN SOCIAL STUDIES FOR 9 SUBJECTS WITH AND 19 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	18.29	1	18.29	.12
Residual	3903.42	26	150.13	
Total	3921.71	27		

TABLE LXXVI

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ALL ITEMS FOR 21 SUBJECTS WITH AND 35 WITHOUT VISUAL RESPONSE MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	3070.52	1	3070.52	8.55**
Residual	19395.41	54	359.17	
Total	22465.93	55		

**Significant at .01 level

TABLE LXXVII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 21 SUBJECTS WITH AND 36 WITHOUT VISUAL RESPONSE, MODEL IV

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	87.61	1	87.61	.30
Trials	1652.23	1	1652.23	63.50**
Group Trials/ Interaction	2.50	1	2.50	.10
Subject	16005.41	55	291.00	11.18**
Residual	1431.27	55	26.02	
Total	19179.02	113		

**Significant at .01 level

TABLE LXXVIII

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 10 SUBJECTS WITH AND 10 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	24.20	1	24.20	1.04
Residual	420.00	18	23.33	
Total	444.20	19		

TABLE LXXIX

ANALYSIS OF VARIANCE: ACHIEVEMENT TEST SCORES IN ARITHMETIC FOR 19 SUBJECTS WITH AND 9 WITHOUT VISUAL RESPONSE, MODEL VII

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Square	"F"
Group	.73	1	.73	.02
Residual	1109.38	26	42.67	
Total	1110.11	27		

File Number
3 4 5

Student's Name

Sex 6 | Age 7 8 | Grade 9 10 | Ethol. 11 12 | Section 13 | Ret/No 14 | Vis. A. 15 | Add. H. 16 | Typ. A. H 17 | Gund. R. 18

No. Ref. 19 20 | Typ. R. 21 | Ref. Dis 22 | Intel 23 | Cond. 24 | Eff. 25

Ach. Test Scores (Cols 33-62) X(80)

	Grade L.	3	4	5	6	7	8	9	10	11	12
01	Read.										
02	Word M.										
03	Lang U.										
04	Arith. R										
05	Soc. S.										
06	Sci.										
07	Spell.										

Grade Scores (Cols. 30-69)

Grade L.	3	4	5	6	7	8	9	10	11	12
Read. M.										
Read. C.										
Writ.										
Spell.										

1(80)

Grade Scores (Cols. 30-69)

Grade L.	3	4	5	6	7	8	9	10	11	12
English										
Soc. Stu.										
Arith										
Sci.										

2(80)

Figure 1

DATA COLLECTION SHEET

MALE/FEMALE
1=Male
2=Female

GRADE SCORES
9=A 5=B- 1=D±
8=A- 4=C+ 0=Failure
7=B+ 3=C
6=B 2=C-

INTELLIGENCE
6=Very Superior (130+)
5=Superior (120 to 129)
4=Bright Normal (110-119)
3=Average (90 to 109)
2=Dull Normal (80-89)
1=Borderline (70-79)
0=Mental Defective (69-)

VISUAL RESPONSE
1=Yes
2=No

GUIDANCE REFERRAL
1=Yes
2=No

NUMBER OF REFERRALS
1=One
2=Two
3=Three, etc.

RETROLENTAL FIBROPLASIA
1=Yes
2=No

CONDUCT/EFFORT
3=Excellent (A)
2=Good (B)
1=Fair/Satisfactory(C)
0=Poor (D)

TYPE ADDITIONAL HANDICAP
1=Cerebral Palsy
2=Speech Handicap
3=Epilepsy
4=Diabetes
5=Hearing
6=Arthritis
7=Cerebral Palsy and Speech

SECTION
4=A
3=B
2=C
1=Special

TYPE REFERRAL
1=Family
2=Behavior
3=Scholastic
4=Physical
5=Combination 1 & 2
6=Combination 1 & 3
7=Combination 3 & 4
8=Combination 2 & 4
9=Combination 2 & 3

ETIOLOGY
1=Retrolental Fibroplasia
2=Cataracts
3=Retinitis Pigmentosa
4=Buphthalmus/ Glaucoma
5=Optic Atrophy
6=Amblyopia
7=Retinoblastoma
8=Other

ADDITIONAL HANDICAP
1=Yes
2=No

NUMBER REFERRALS
1=One
2=Two
3=Three, etc.

AGE (chronological)
8=Eight (C.A.)
9=Nine (C.A.)
10=Ten (C.A.), etc.

GRADE
2=Special Class
3=Third Grade
4=Fourth Grade, etc.

REFERRAL DISPOSITION
1-Guidance and Counseling
2=Environmental Manipulation
3=Psychiatric Treatment
4=Medical Treatment
5=Discipline
6=Combination 1 & 2
7=Combination 2 & 3
8=Combination 3 & 4
9=No Program Necessary

FIGURE 2

Coding Sheet for Data Collection

Mic60

5819